OSD UAS Airspace Integration Plan

FAA UAS Conference
San Diego, CA
Dallas Brooks, OUSD/AT&L, Unmanned Warfare
February 25, 2010

RFC Fundamentals Course (Detail)

Introduction to Physiology

Fatigue, Circadian Rhythm, Meds, Physicals, and DNIF

Stress Awareness and Management

Introduction to Theater Navigation

Theater Command and Control

Air Tasking Order & Special Instructions (ATO/SPINS)

Basic C4I for Air Operations

Aircraft Identification Procedures

Portable Flight Planning Software (PFPS) / Falcon view

Introduction to Combat Operations

Communications Concepts

Sensor Antennas

Air Defense Radars

Specialized Radars

Electro-Optics Sensors

Electronic Attack (EA) and Electronic Protect (EP)

Electronic Support (ES) and Signals Intelligence (SIGINT)

ISR and NTISR

Introduction to U.S. Space Operations

Navigation Warfare

Network Warfare

Integrated Air Defense Systems (IADS)

Indirect Threat Systems

AAA Concepts

AAA Systems

Missile Concepts 1

Missile Concepts 2

Territorial SAM Systems

Tactical SAM Systems

MANPAD and Hybrid SAM Systems

Future Threat Systems

Asymmetric Threats

Current IO/EW Threats

Unmanned Aircraft Systems

Introduction to USAF Weapons

Weapons Basics and Delivery

Guided Munitions Employment

Targeting and Weapon Selection

Tactical Communications

Tactical Mission Planning

Joint/Integrated Operations

Introduction to SEAD Fundamentals

Signaling Devices and Recovery

Signaling Laboratory

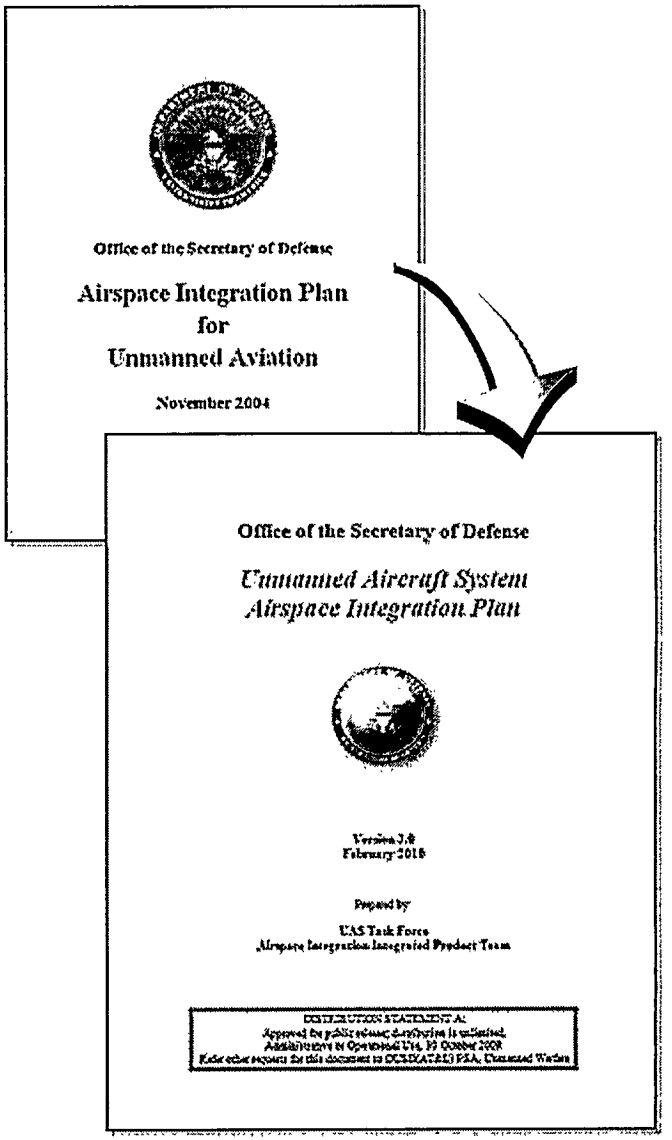
On Scene Commander Fundamentals ★

Camp Bullis Orientation

OSD UAS Airspace Integration Plan

Purpose

- Updates the November 2004 *OSD Airspace Integration Plan (AIP) for Unmanned Aviation*
- Outlines DoD's equities in UAS Integration
- Defines an incremental DoD NAS access strategy
- Defines foundational activities for NAS Access
- Identifies validation activities needed to show compliance
- Defines capabilities and resources needed for current and future operations
- Informs the ExCom NAS Access Working Group process



CREW-6219

Requirement

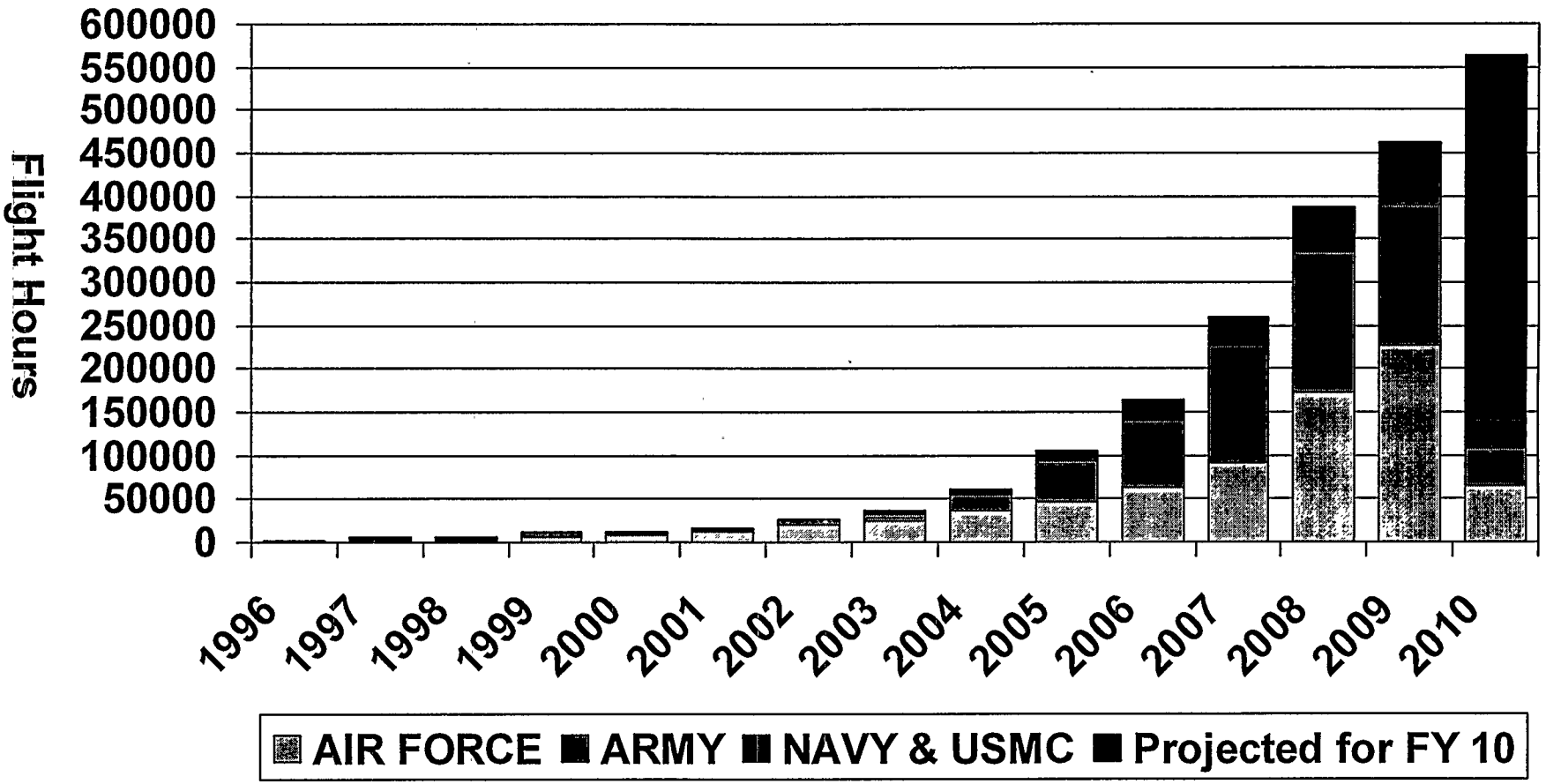
There is an ***Operational Need*** for DoD Unmanned Aircraft Systems (UAS) to operate in the National Airspace System (NAS) to:

- Train military UAS pilots and sensor operators in real-world conditions to prepare them for battle
  - Shortfalls in trained and ready UAS operators put American lives at risk
- Conduct operational sorties to support COCOM missions and taskings
  - Homeland defense, disaster relief/recovery
- Develop, Test & Evaluate aircraft, systems and procedures to support battlefield objectives

All DoD UAS operations directly support National Security

Requirement

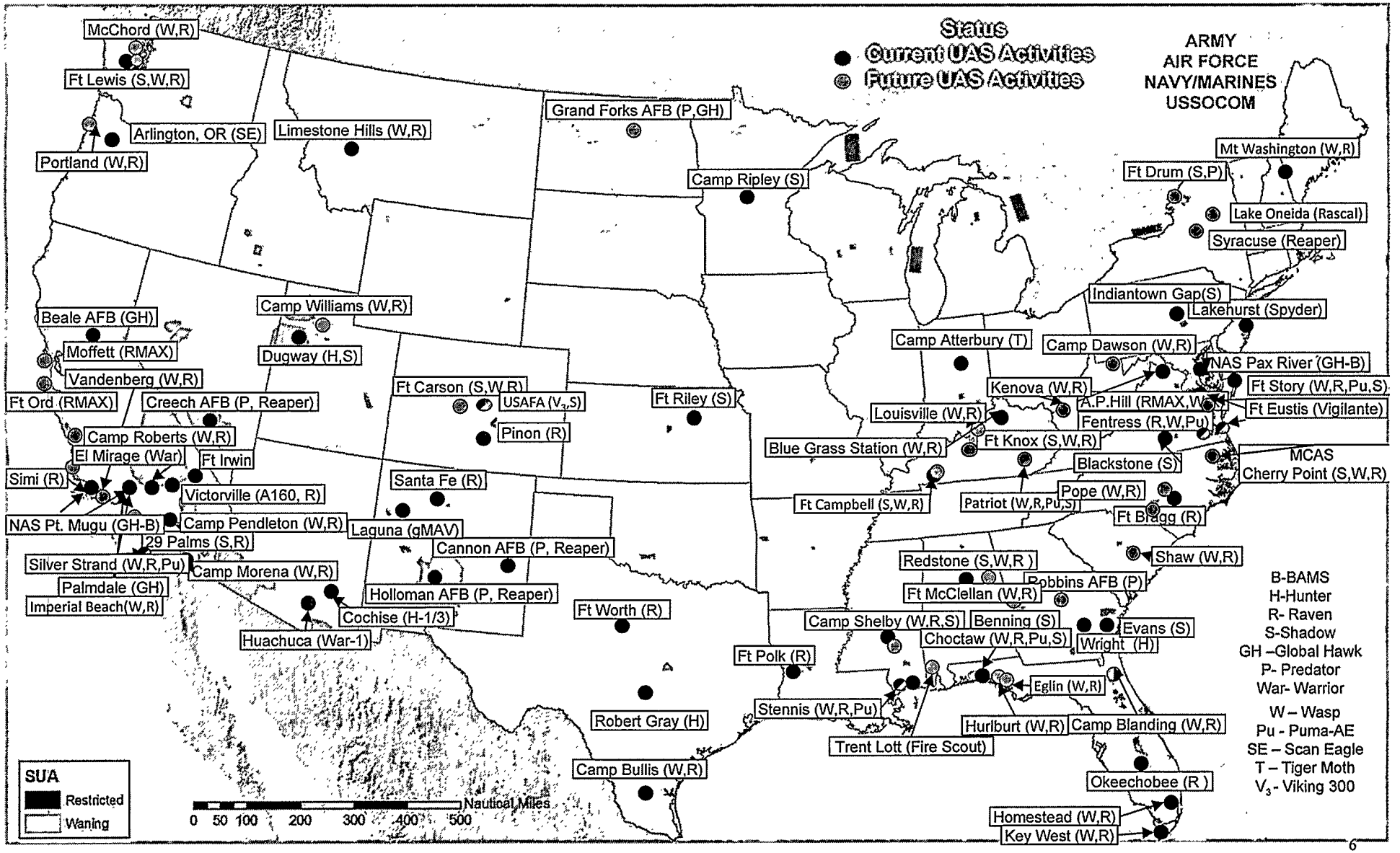
DoD UAS Flight Hours by Fiscal Year



Does not include man-portable Small UAS
(e.g., Raven)

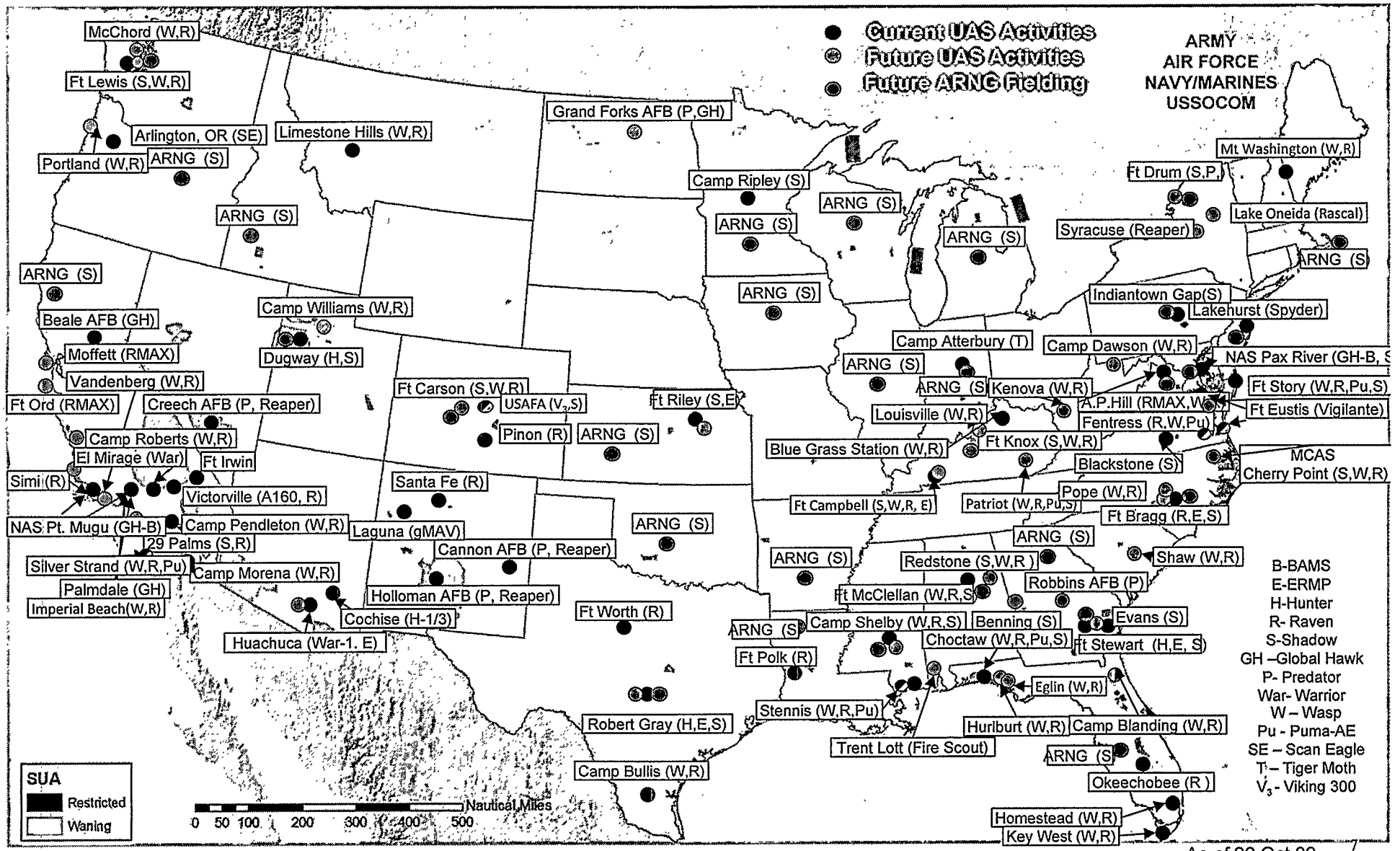
DoD UAS Activities

Current and Projected Through FY11



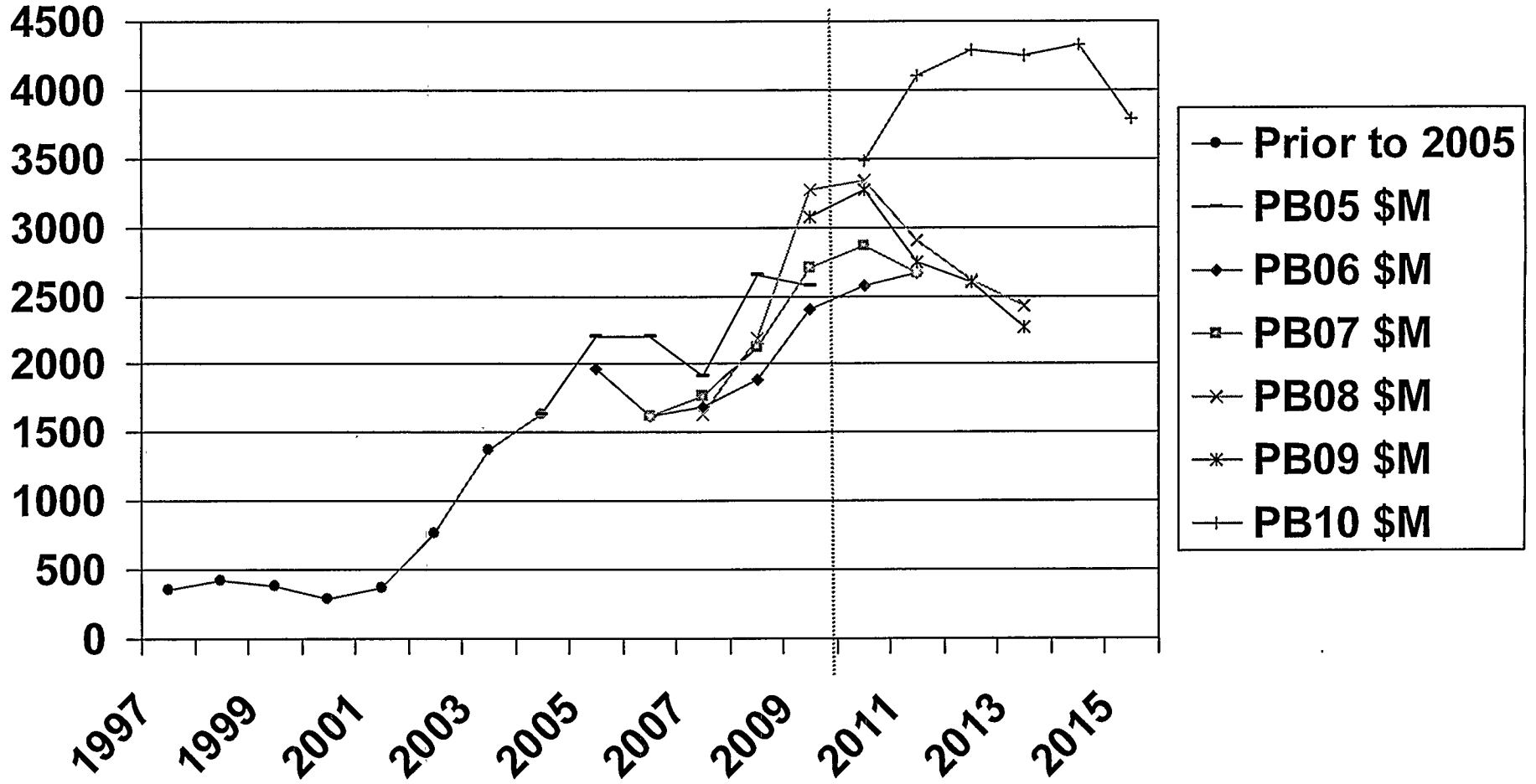
DoD UAS Activities

Projected Operations Through FY16



As of 26 Oct 09

DoD UAS Funding
(RDT&E & Procurement)

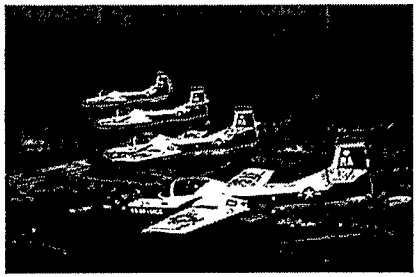
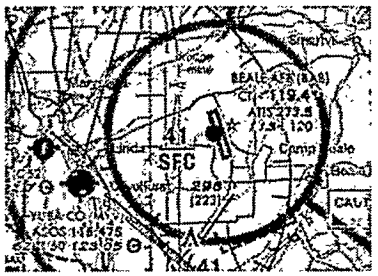


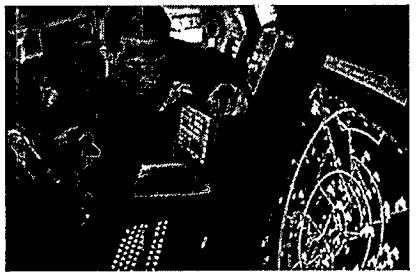
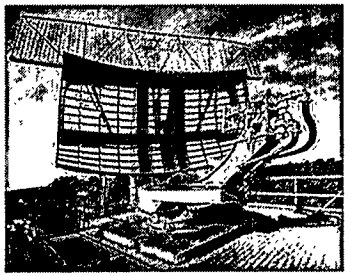
PB 10 included $189M through the FYDP for UAS Airspace Integration

DoD Equities in UAS Integration
Leadership

- DoD is the single largest operator of unmanned aircraft in the world
  - The most aircraft
  - The most pilots
  - The most experience in all phases of UAS operations

- Outside of FAA, the DoD is the largest:
  - Regulator of pilots & aircraft
  - Certificator of aircraft and avionics systems
  - Manager of airspace
  - Employer of air traffic controllers
  - Operator of airfields and air traffic systems

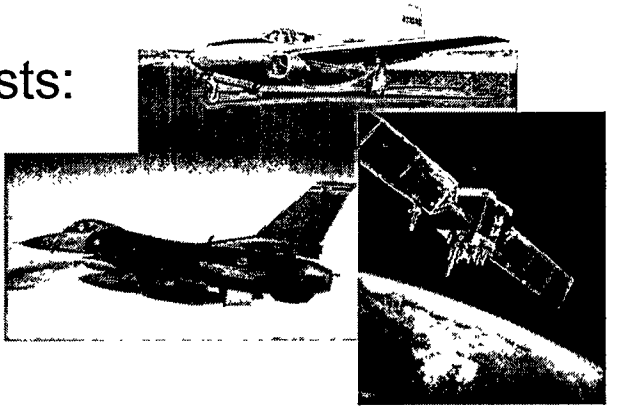



DoD Equities in UAS Integration
Strengths

DoD enjoys:

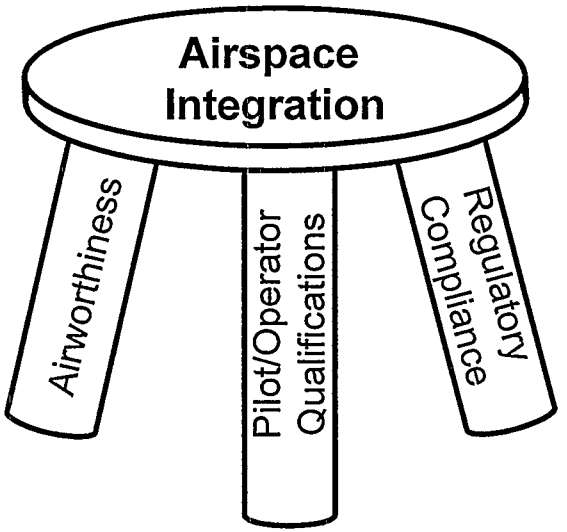
- World-class aviation aviation R&D expertise
- Established partnerships with FAA, NASA, DHS and others
- Unparalleled control over DoD aircraft, operators, facilities and airspace
- A long history of US aviation/certification firsts:
  - Jet propulsion
  - Composite materials
  - Fly-by-wire
  - GPS



DoD not only has the <u>requirement</u> for NAS Access, we have the <u>resources</u> and <u>expertise</u> to address it

Foundational Activities

There are three foundational requirements needed for any aircraft (manned or unmanned) to integrate routinely into the NAS:



Foundational Activities
Overview

- Airworthiness
  - Update MIL-HDBK-516 to address gaps for DoD UAS certification

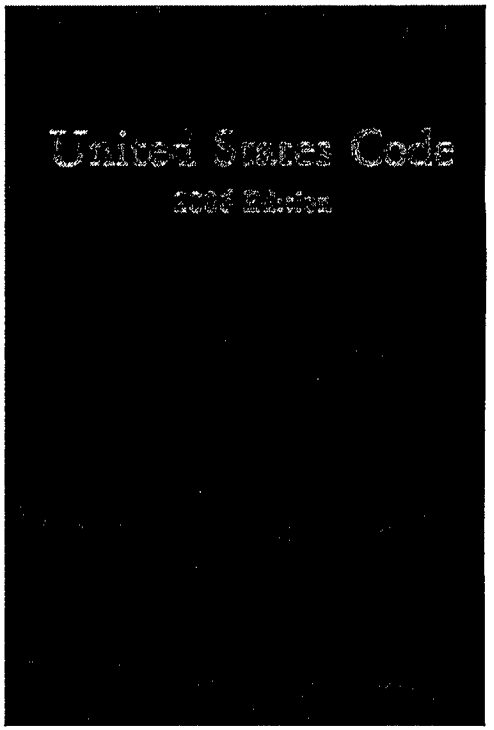
- Pilot/Operator Qualifications
  - Military Departments develop/implement training syllabi/standards
  - DoD instruction (CJCS3325.01) provides qualification targets
  - Service validation activities evaluate effectiveness and adjust curriculum

- Regulatory Compliance
  - Procedural
    - Class D/G operational procedures
    - Blanket COAs / COA Reform
    - ATC standard phraseology/terminology
    - Lost link / Divert / Recovery guidelines
    - Self Separation / Coll. Avoidance criteria
    - Operating area rules
  - Materiel
    - GBSAA
    - ABSAA
    - SAA Displays
    - Maneuver algorithms
    - Weather Avoidance
    - Auto-Takeoff / Auto-Land
    - Other

Foundational Activities
Authorities & Responsibilities

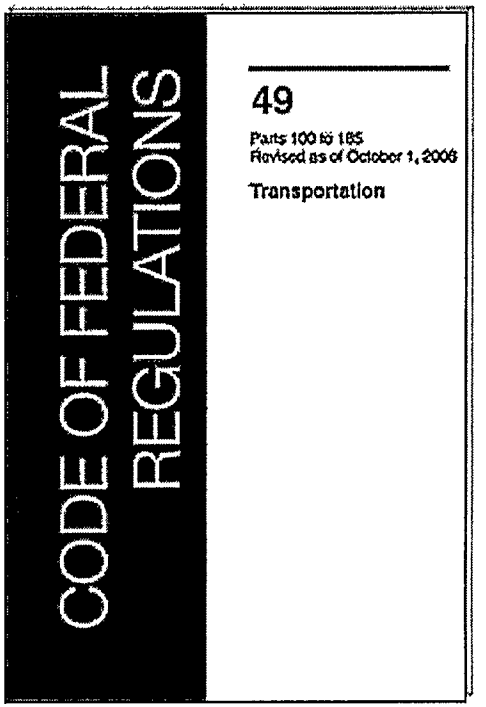
- Title 10 of the United States Code grants the Secretaries of the Military Departments "are responsible for, and have the authority to conduct, **all affairs** of the Department"
- Specifically addresses:
  - Training
  - Equipping (including R&D)
  - Manufacture/repair of military equipment (aircraft, sensors, systems)

- Also charged with "carrying out the functions of the Department…so as to fulfill the current and future operational requirements of the unified and specified combatant commands"



Foundational Activities
Authorities & Responsibilities

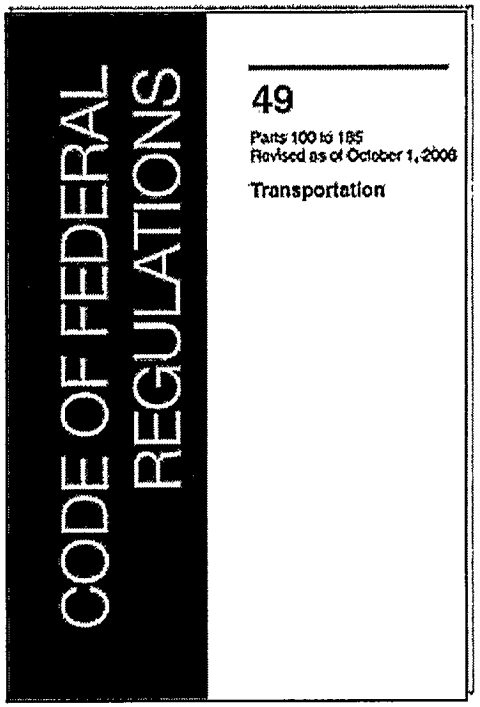
- DoD UAS meet the statutory requirements for "Public" aircraft under 49 USC § 40102 and § 40125
- As public aircraft, **the airworthiness of DoD UAS is certified solely by the Military Departments**
- As operators of public aircraft, **DoD UAS pilots are certified solely by the Military Departments.**



The DoD certifies the airworthiness of our aircraft and the qualification of our pilots

Foundational Activities
Authorities & Responsibilities

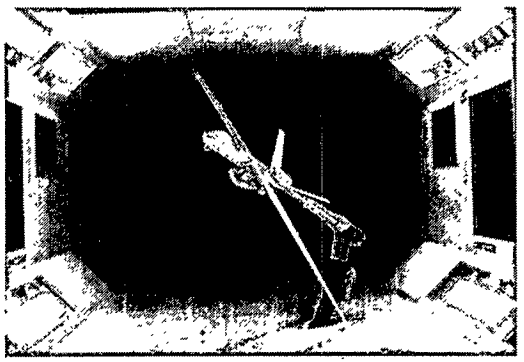
- FAA authority to regulate aviation activities is granted by statute in Title 49, United States Code
- Chapter 401 (§ 40103) specifically grants FAA Administrator the authority to *"develop plans and policy for the use of the navigable airspace and assign by regulation or order the use of the airspace necessary to ensure the safety of aircraft and the efficient use of airspace"*
  - Primarily codified in Part 91, *General Operating and Flight Rules*
  - Multiple exemptions/exceptions exist for military aviation operations

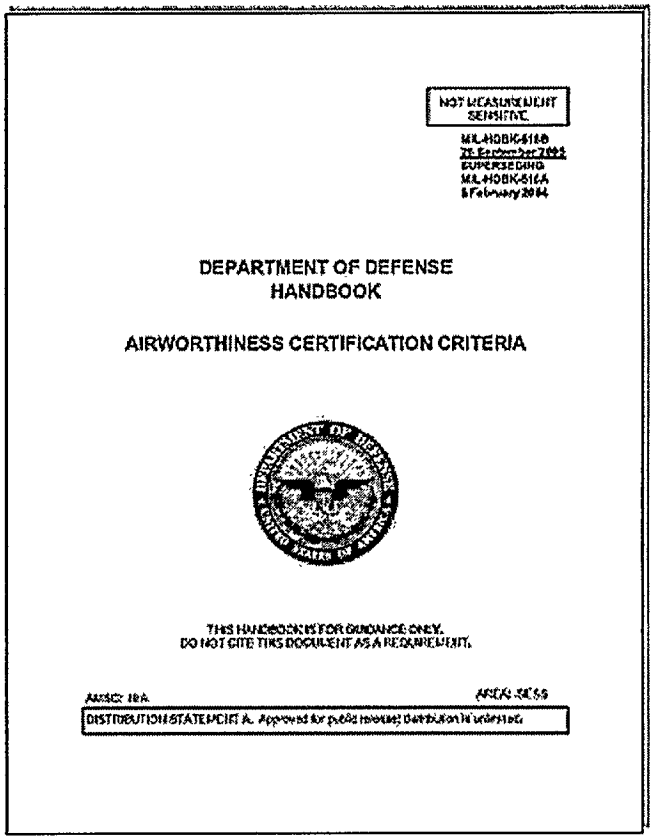


The FAA sets the NAS "rules of the road"
DoD ensures compliance for our systems & pilots

Foundational Activities
Airworthiness

- Detailed airworthiness criteria for DoD aircraft is published in MIL-HDBK-516
  - While the majority of existing guidance is translatable to UAS, there are gaps
- DoD has accelerated development of UAS criteria to address those gaps within the next 12 months




NOT MEASUREMENT SENSITIVE

MIL-HDBK-516B
26 September 2014
SUPERSEDING
MIL-HDBK-516A
6 February 2014

DEPARTMENT OF DEFENSE
HANDBOOK

AIRWORTHINESS CERTIFICATION CRITERIA

THIS HANDBOOK IS FOR GUIDANCE ONLY.
DO NOT CITE THIS DOCUMENT AS A REQUIREMENT.

AMSC N/A AREA AIRS

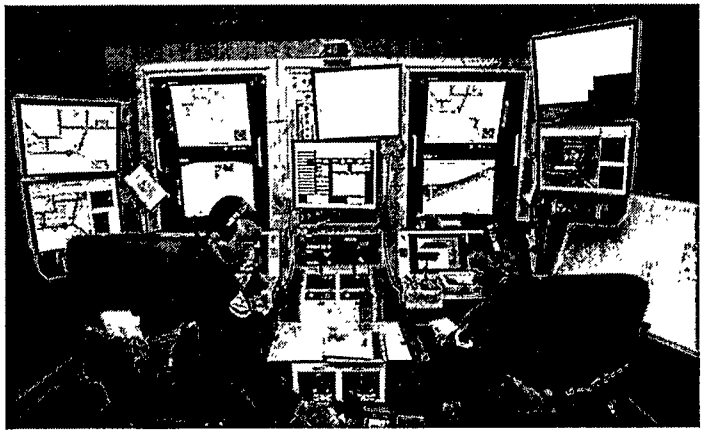
DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

Panel Topic: Mr Pete Heasley, US Navy

Foundational Activities
UAS Pilot/Operator Qualification

- DoD Services train and certify their pilots
  - Military pilots do much more than transit the NAS
    - Air combat maneuvering, weapons employment, strategic/tactical payload delivery, surveillance, CAP, etc.
  - NAS qualification is integrated into training/certification programs
  - Aircraft-specific qualification is required for most platforms
    - UAS are no different

- Two sources for DoD UAS pilots
  - Transition experienced pilots from other aircraft
  - Train new pilots for ground-up UAS qualification



Panel Topic: Col Trey "Lex" Turner, US Air Force

Foundational Activities
Regulatory Compliance

- DoD has the responsibility to ensure that military aircraft operations are conducted in compliance with applicable operational rules (e.g. Part 91)

- For UAS, this means leveraging new technologies, procedures, and policies to address compliance
  - Technologies (sensors, conflict detection)
  - Policies (certification, equipage)
  - Procedures (terminal, avoidance, lost-link)

- DoD/FAA continue to partner on procedural UAS access approaches
  - Class G over DoD bases/lands (small UAS)
  - Class D at non-joint-use DoD airfields (all UAS)

Panel Topic (Procedures): COL Bob Hess, US Army

Foundational Activities
Regulatory Compliance

- DoD has specific, near-term access requirements
  - CONUS launch/recovery of operational missions
  - Access to/movement within defined operating/training areas
  - Homeland defense/OGA support (e.g. disaster relief)
  - Terminal operations
  - Small UAS training

- Focus: enable these specific access requirements in the near-term

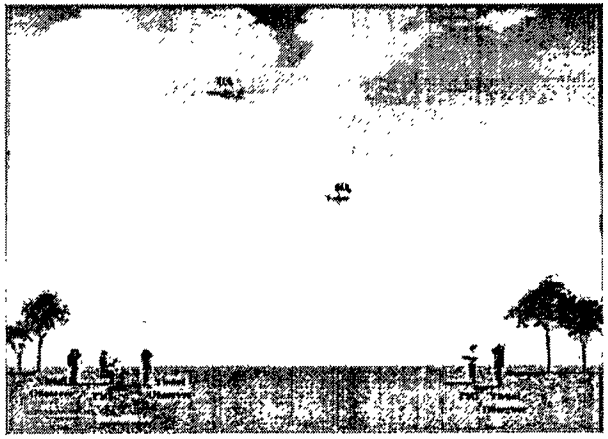
- Keys to success:
  - Identify, scope and target critical UAS flight profiles
  - Focus resources/expertise to address those specific profiles
  - Certify solutions for use at multiple locations

Tailored solutions enable near-term, routine UAS operations

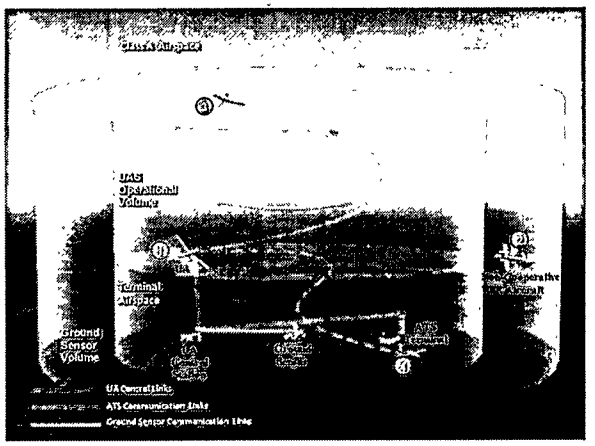
Incremental DoD NAS Access Strategy

UAS Access Profiles

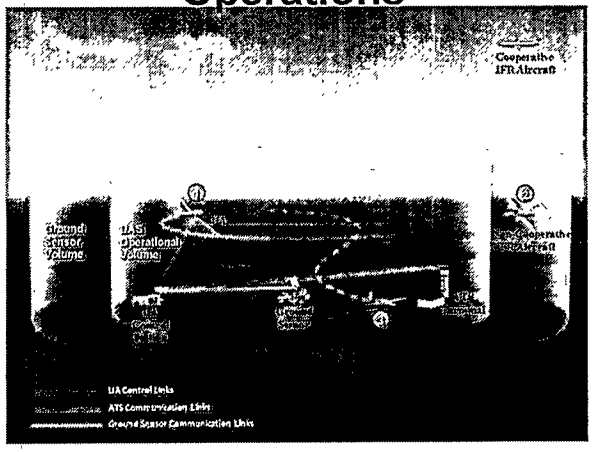
Line-of-Sight Operations



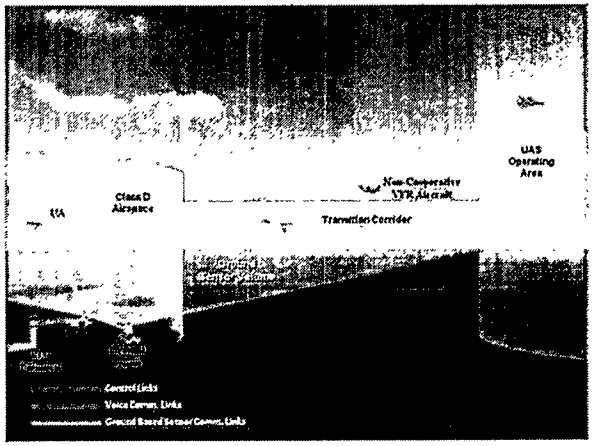
Terminal Area Operations



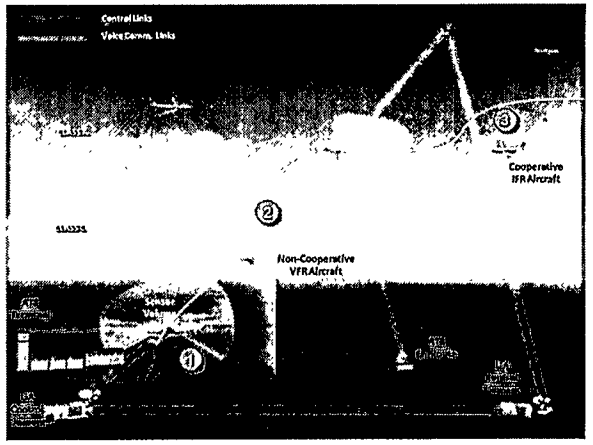
Vertical Transit Operations



Lateral Transit Operations



Dynamic Operations



UAS Access Profiles

Line-of-Sight Operations

Incremental Capability:

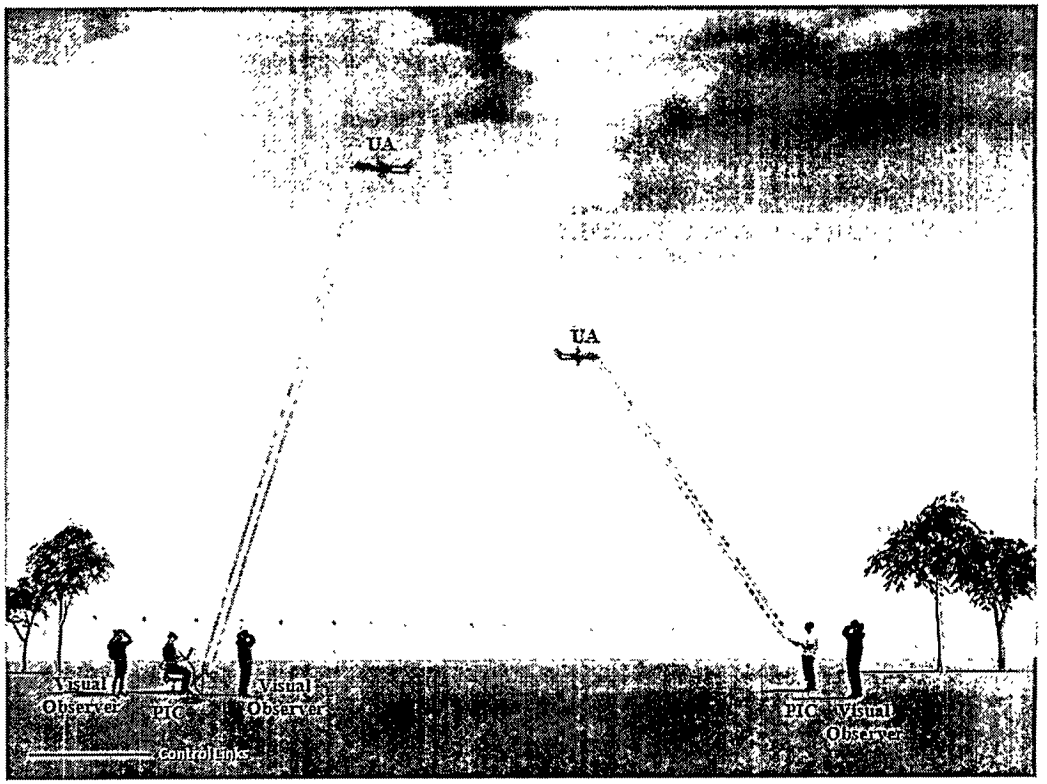
- Establishes a means to conduct UAS operations in VFR conditions

Airspace Classes enabled:

- Class D, E & G operations

UAS Group(s) supported:

- Groups I, II, some III



Implementation Needs:

–DoD/FAA MOU

–sUAS SFAR

–Qualified Observer

UAS Access Profiles

Terminal Area Operations

Incremental Capability:

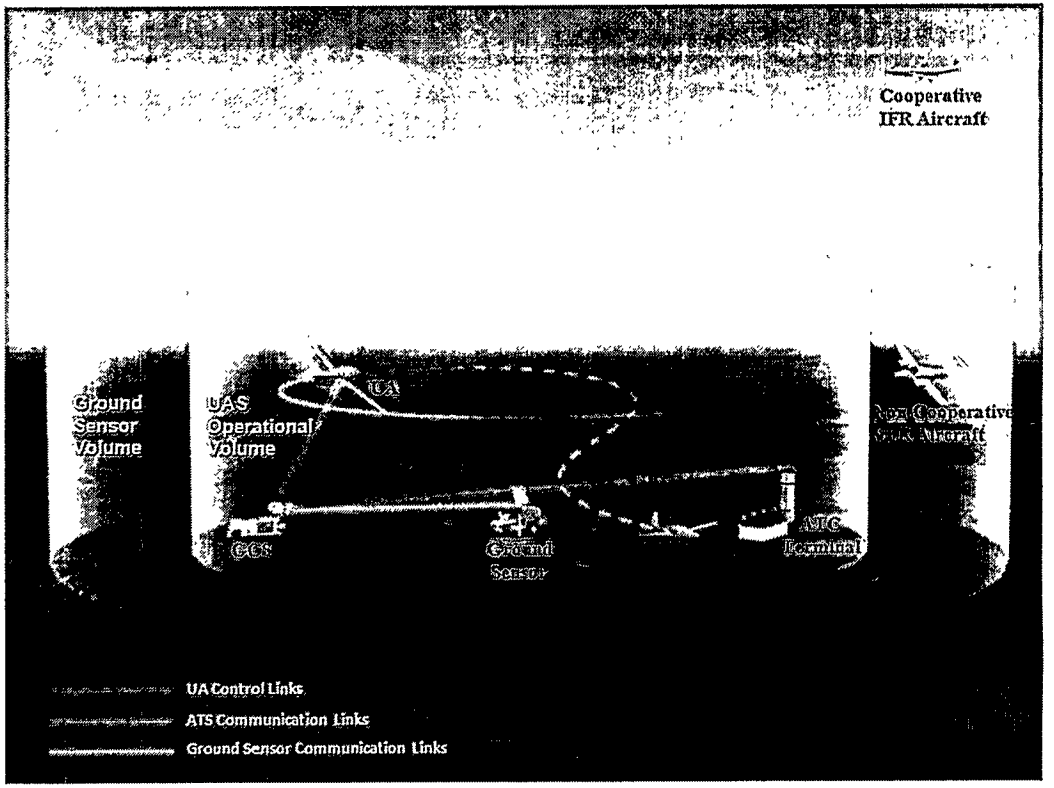
- Establishes the ability to conduct terminal area operations in a confined volume of airspace
- Facilitates terminal operations and training (e.g. take-off & landing)
- Relies on ground sensors and/or observers to detect other aircraft and provide the UAS pilot with the necessary information needed to maintain self separation

Airspace Classes enabled:

- Class D operations

UAS Group(s) supported:

- All Groups



Implementation Needs :

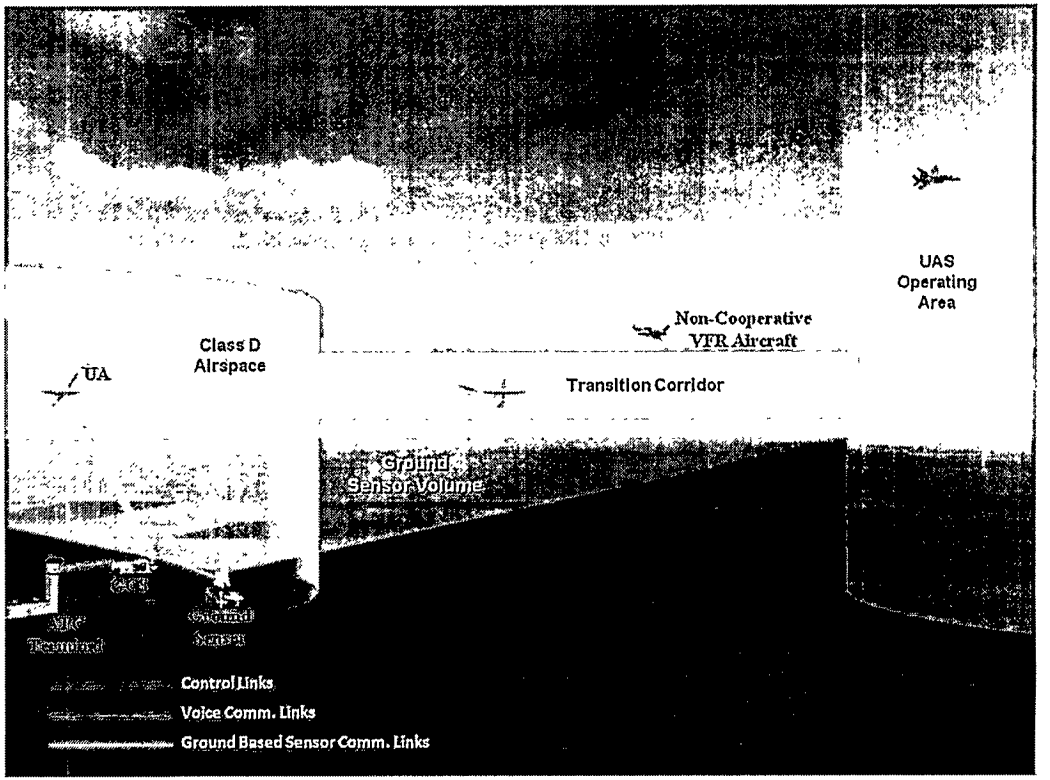
–DoD Class D Procedures
–Enabling technologies (e.g. GBSAA) or observers
–Airworthy UAS
–Qualified Pilots

UAS Access Profiles

Lateral Transit (Corridor) Operations

Incremental Capability:

- Enables UAS the ability to safely transition through a predefined horizontal corridor within the NAS that bridges two volumes of airspace (e.g. Class D & Restricted Area)
- Corridor can be implemented at any altitude, but will typically reside in class E airspace (above 1200' AGL, below 18K ft MSL)
- Relies on ground sensors to detect other aircraft and provide the UAS pilot with the necessary information needed to maintain self separation



Airspace Classes enabled:

- Class A & E operations

UAS Group(s) supported:

- Groups III, IV & V

Implementation Needs:

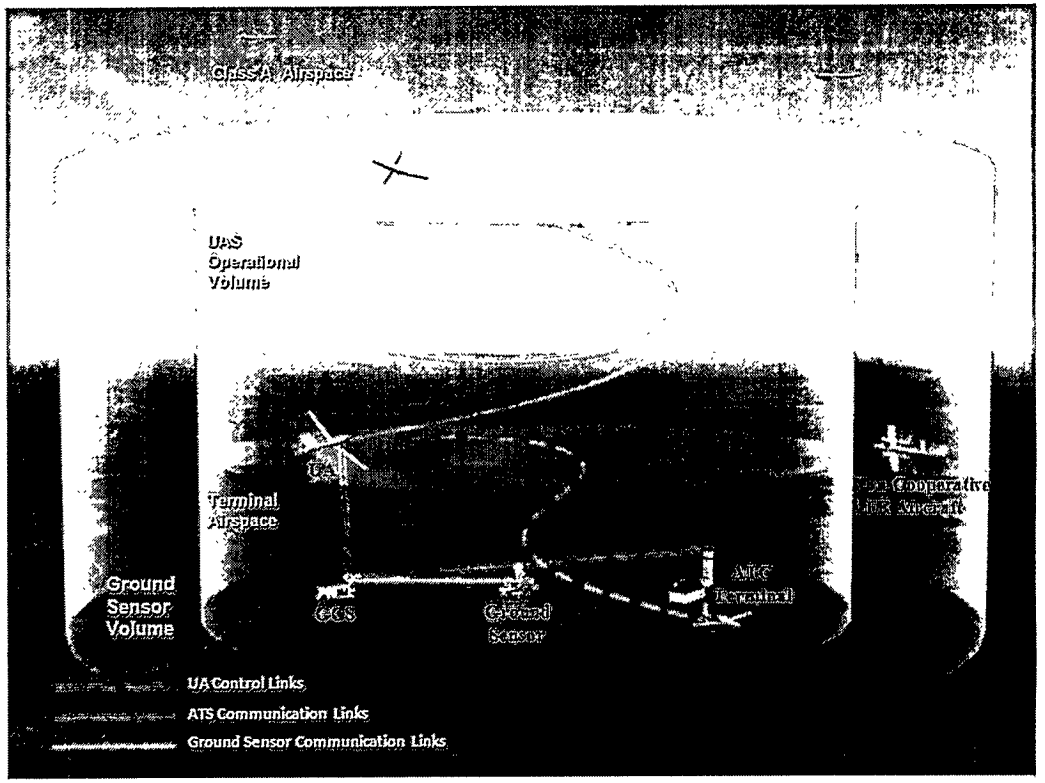
–Procedures (e.g. lost link, divert, recovery)
–Enabling technologies (e.g. GBSAA)
–Airworthy UAS
–Qualified Pilots

UAS Access Profiles

Vertical Transit (Cylinder) Operations

Incremental Capability:

- Enables UAS the ability to safely transition through a predefined vertical corridor that bridges a lower and a higher body of airspace
- Corridor can be implemented at any altitude, but will typically facilitate operations between terminal airspace and Class A (positive control) airspace
- Relies on ground sensors to detect other aircraft and provide the UAS pilot with the necessary information needed to maintain self separation



Airspace Classes enabled:

- Class A, C & E operations

UAS Group(s) supported:

- Groups IV & V

Implementation Needs:

–Procedures (e.g. lost link, divert, recovery)
–Enabling technologies (e.g. GBSAA)
–Airworthy UAS
–Qualified Pilots

UAS Access Profiles

Dynamic Operations (Full Integration)

Incremental Capability:

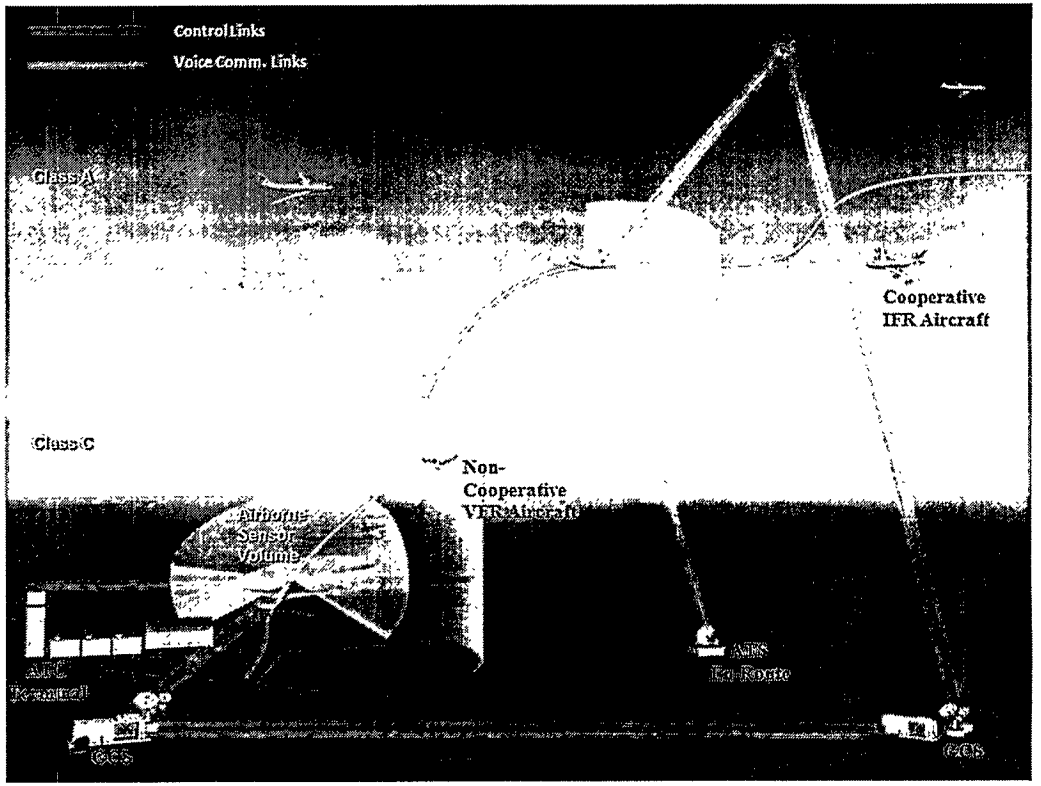
- Provides UAS the ability to safely conduct routine operations within the NAS in a similar manner to how manned aircraft operate today
- Relies on airborne sensors to detect other aircraft and autonomously perform self separation and collision avoidance

Airspace Classes enabled:

- All Airspace Classes
- En Route & Contingency

UAS Group(s) supported:

- Groups III, IV & V



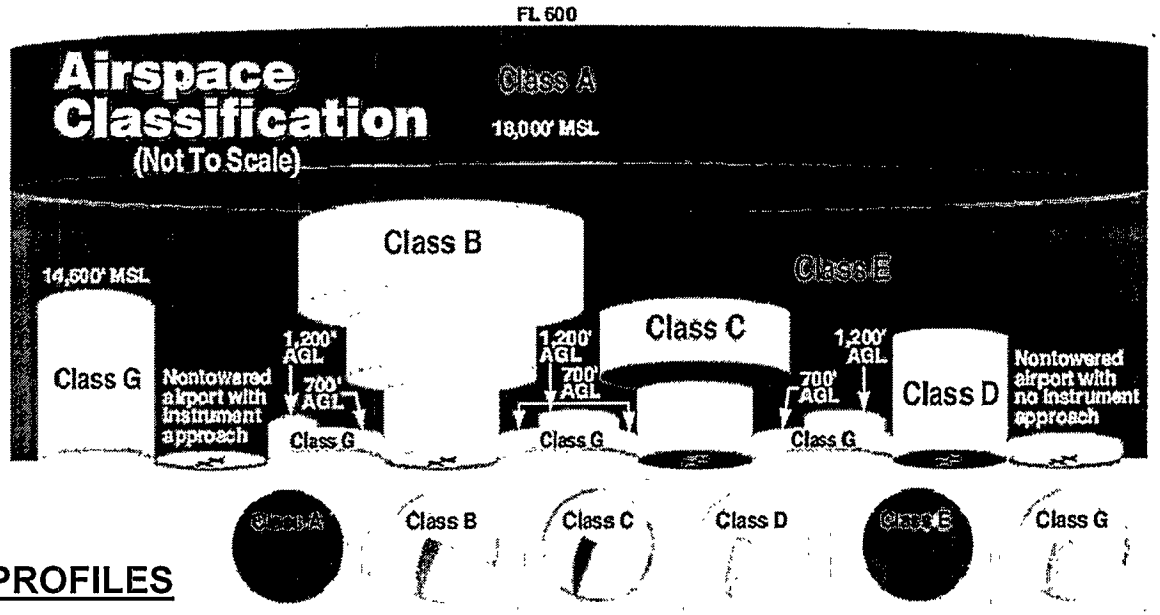
Implementation Needs:

–Adopted technical standards for UAS
–Certified technical solutions (e.g. ABSAA)
–Airworthy UAS
–Qualified Pilots/Operators

Incremental DoD NAS Access Strategy

UAS Access Profiles

- *UAS Access Profiles achieve incremental NAS access to all required classes of airspace.*



UAS ACCESS PROFILES

Line of Sight Operations				X	X	X
Terminal Area Operations				X		
Lateral Transit (Corridor) Operations	X		X	X	X	
Vertical Transit (Cylinder) Operations	X		X	X	X	
Dynamic Operations (File & Fly)	X	X	X	X	X	X

Validation Activities

- Develop a repeatable and quantifiable safety approach / methodology
  - Applicable to any UAS in any location
- Establish acceptance thresholds for implementation
  - Consider all safety mitigations (e.g. traffic volume/density, ground population, aircraft performance, airspace restrictions, and operating rules)
- Develop and implement technical standards for certification
  - Defines the critical metrics and thresholds
  - Obviates need to submit safety cases for each UAS/location
- Use existing Programs of Record to develop and prove concepts and solutions
  - GBSAA
  - ABSAA

A standardized safety methodology is needed so that only the results are evaluated, not the methodology used to attain the results.

Way Ahead

Establishment of 3 Phases to Incrementally Increase Capability

- ***Phase 1: Develop procedural remedies***
  - Addresses: sUAS, Class D, and operations under CoA
  - Timeframe: 2007 – 2011
  - Success Criteria:
    - Formalized agreement between FAA/DoD that authorizes access to specific categories of airspace
    - Reformed COA application and approval process
    - Formally-ratified safety case methodology and target level of safety

- ***Phase 2: Develop standards and leverage existing technologies***
  - Addresses: Local airfield and transit operations
  - Timeframe: 2010 - 2013
  - Success Criteria:
    - Developed, certified and fielded GBSAA system
    - Standardized procedures for avoidance, coordination and contingencies
    - Creation of a Fielding Plan that guides implementation at any UAS basing location

- ***Phase 3: Develop standards and certify new technologies***
  - Addresses: All UAS missions in any operating location and global airspace
  - Timeframe: 2012 - 2018
  - Success Criteria:
    - Developed and approved technical standards and performance specifications
    - Developed, certified and fielded ABSAA system

Summary

- DoD's UAS NAS access requirements are only increasing (and fast)
- DoD has the resources, expertise, facilities, and authority to rapidly develop, field, and certify key aspects of NAS integration for military UAS:
  - Airworthiness
  - Pilot/Operator Qualification
  - Systems
  - Policies
  - Procedures
- DoD's phased approach delivers near-term capability to the warfighter while synchronizing with Congressionally-imposed timelines
- DoD is committed to working closely with our ExCom partners to achieve routine, safe access for UAS in the NAS

Panel Topic

Airworthiness

Mr Pete Heasley

US Navy

Airworthiness Objectives
DoD Airspace Integration IPT

"The development of airworthiness criteria, standards, and methods of compliance for both fixed and rotary wing UAS (GCS and links included) to enable those systems to more routinely access the NAS with less operational restrictions."

Drivers

- Title X requires that Departments self-certify airworthiness
- MIL-HDBK-516 is the DoD-recognized airworthiness criteria set for certification

Current Impact

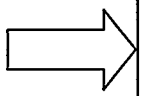
- Without airworthiness criteria/standards/ and means of compliance, UAS platforms will not be designed, nor built, nor verified, to a level in which they can earn the full measure of DoD airworthiness certification. As a result, they will be subject to numerous restrictions levied upon them.

Benefits of updating -516

- **Efficiency.** "Tailoring down" from manned standards for each new UAS platform is neither efficient nor timely
- **Accuracy.** Reduces inconsistencies in data requirements platform to platform
- **Flexibility.** Lack of standards is resulting in stringent operational limitations

OSD Resource Commitment

OSD has agreed to resource the Services to address the UAS Airworthiness Standards Gaps through the UAS Task Force and Airspace Integration IPT



OFFICE OF THE UNDER SECRETARY OF DEFENSE

OCT 0 9 2009

MEMORANDUM FOR PROGRAM EXECUTIVE OFFICER, UNMANNED AVIATION AND STRIKE WEAPONS
AERONAUTICAL SYSTEMS CENTER, ENGINEERING DIRECTORATE
ARMY PROGRAM EXECUTIVE OFFICE AVIATION

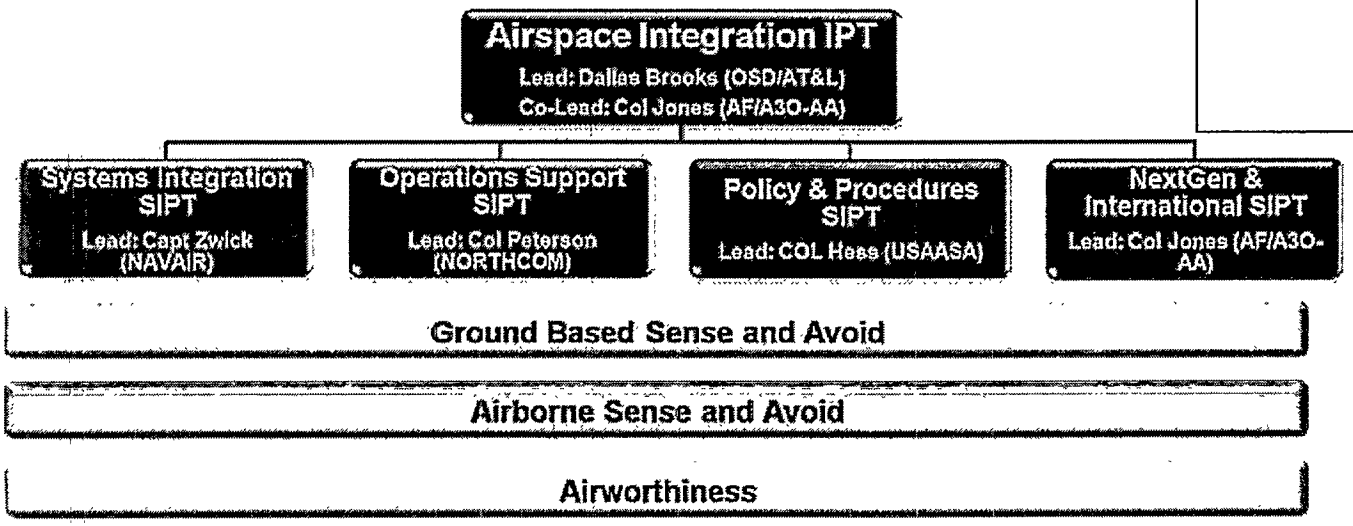
SUBJECT: Unmanned Aircraft Systems (UAS) Airworthiness Criteria

The Department's FY2010 budget submission includes funding for UAS airspace integration efforts. The top priority for the FY2010 airspace integration funding is updating the *Department of Defense Airworthiness Handbook*, "*Airworthiness Certification Criteria (MIL-HDBK-516)*" to include criteria specific to UAS.

Assuming the FY2010 Appropriations Act is enacted with the requested UAS airspace integration funds, funding for the update of the MIL-HDBK-516 ($1.5 M) Research, Development, Test and Evaluation) will be distributed either directly to your Military Department's airworthiness office or through the appropriate Program Executive Office or Program Office approximately 30 days after it is received by the Department.

To expedite the distribution of funds a statement of work with a cost estimate must be provided by October 15, 2009 to Mr. Jim Greenley at james.greenley@dau.mil using the attached template. Mr. Greenley can also be contacted at 703-695-1600.

David G. Ahern
Director
Portfolio Systems Acquisition

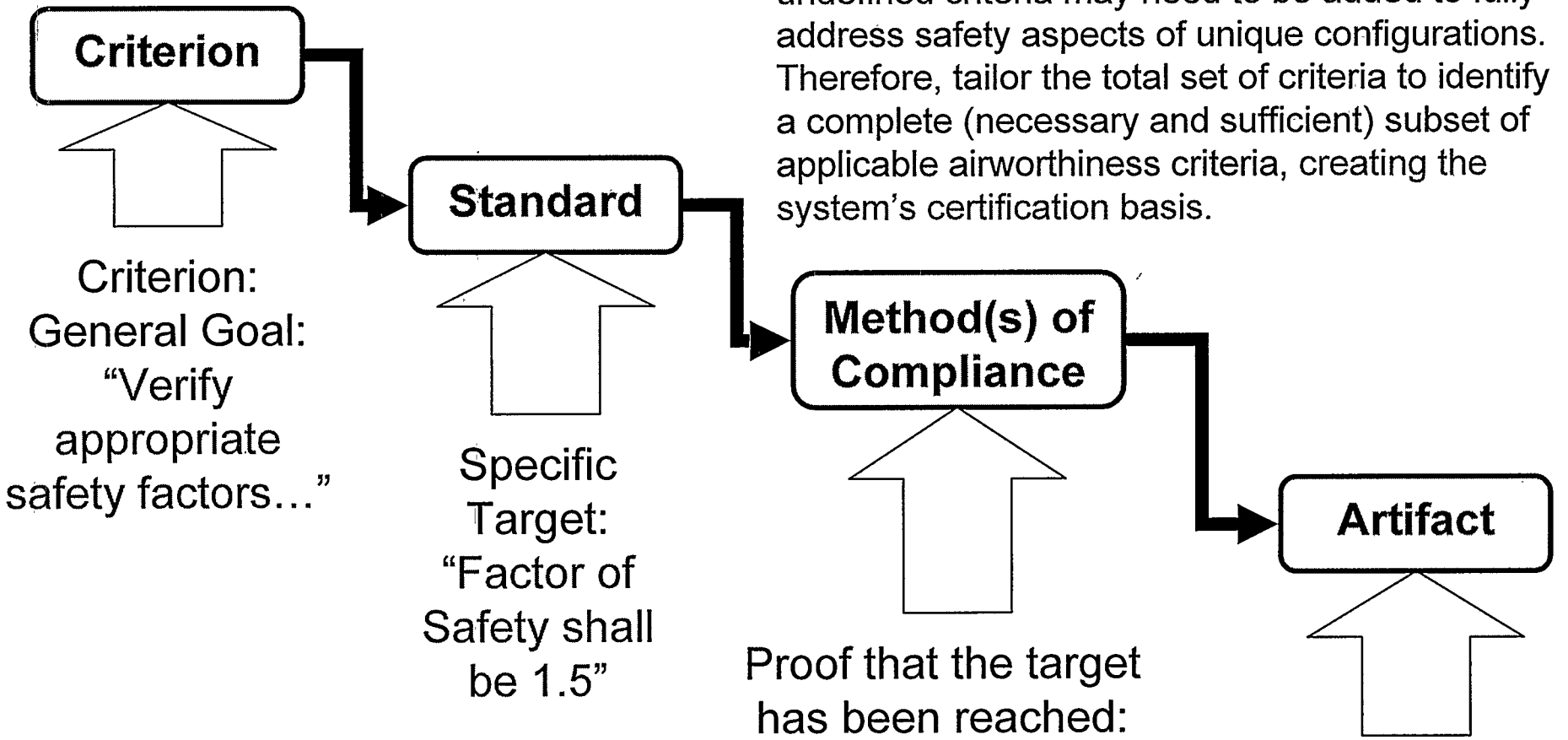


UAS TF Objective 4.3
Work with Service flight certification activities to ensure that UAS specific airworthiness issues are addressed in a coordinated and collaborative forum.

MIL-HDBK-516 Tailoring Process

DoD UAS

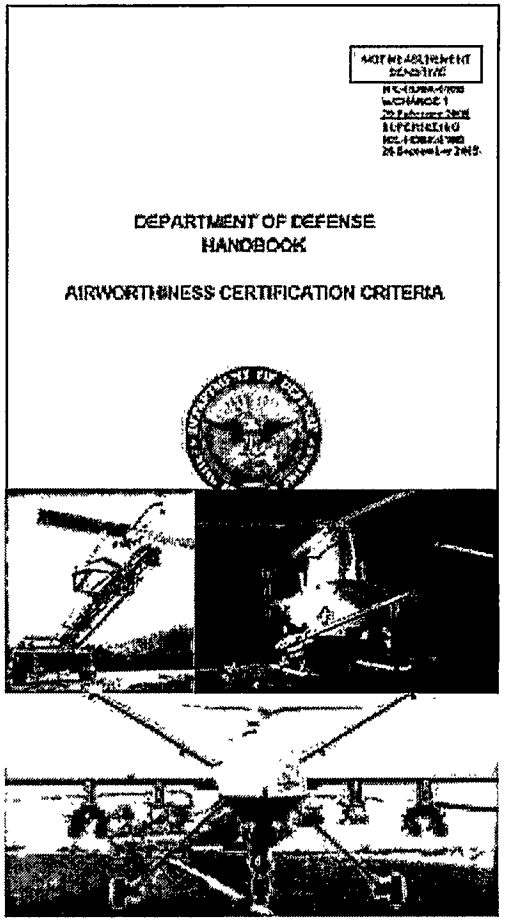
MIL-HDBK-516 Para 1.2.1 Tailoring to create the certification basis: ". . .previously undefined criteria may need to be added to fully address safety aspects of unique configurations. Therefore, tailor the total set of criteria to identify a complete (necessary and sufficient) subset of applicable airworthiness criteria, creating the system's certification basis.



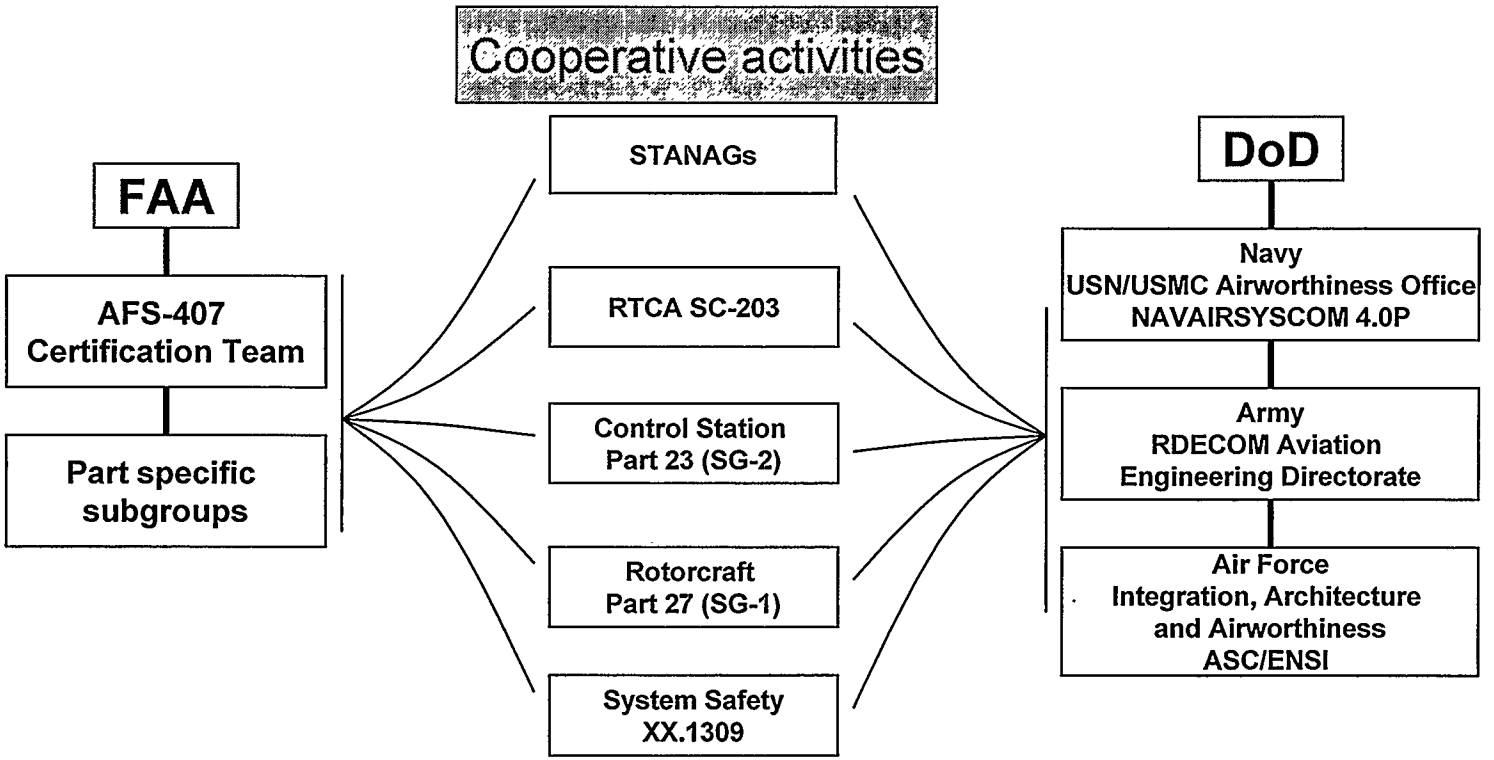
Activity Outline

Development of UAS Criteria/Standards from many sources

- Derived from existing UAS program specifications
- Tailored for UAS application from an existing manned specs
- Best practices and Lessons Learned from existing programs
- NATO Efforts – STANAG 4671, STANAG 4702, STANAG 4703
- University Studies
- Leverage Standards bodies (e.g. SAE, ASTM, etc)



DoD/FAA Cooperative Activities
Airworthiness



FAA and DoD participate in each other's airworthiness activities to varying degrees from full and active membership in the specific workgroups to providing review and comment to group product

Summary

- Development of UAS specific criteria/standards will improve the efficiency and effectiveness of this process and will reduce the number of resulting operational limitations
- Service airworthiness offices (and related subject matter experts) within DoD are currently engaged in a 12 month activity cycle to develop UAS specific criteria/standards
  - Results will inform airworthiness certification basis development to streamline NAS access for DoD UAS
- Services are leveraging many current and future activities in the development of UAS standards
  - Existing UAS programs
  - International forums (e.g. NATO STANAGs)
  - University studies
  - Joint working groups
- Services are participating in multiple cooperative efforts with the FAA and other agency stakeholders to understand and address UAS airworthiness issues

Panel Topic

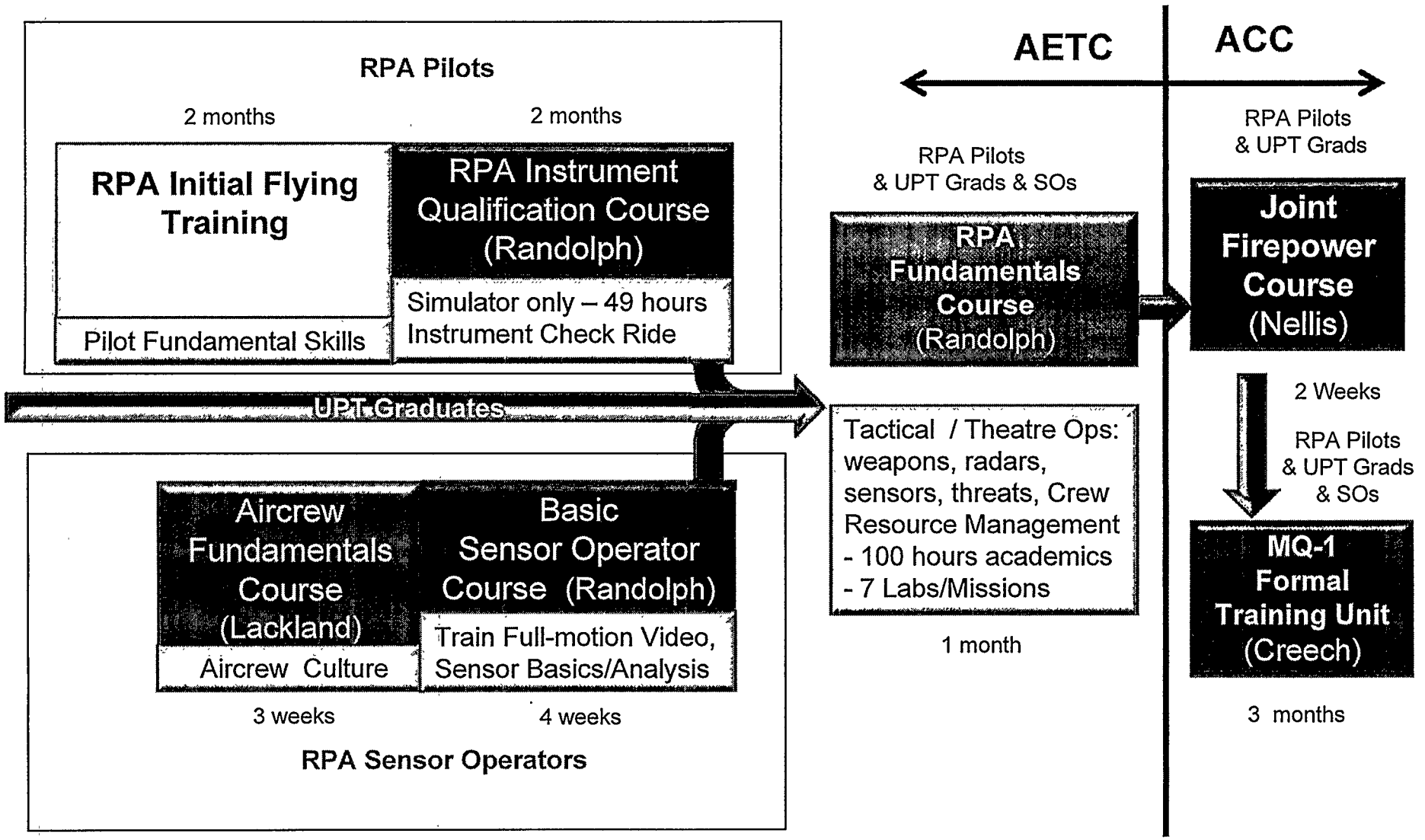
Air Force UAS Pilot Training

Col Trey "Lex" Turner
HQ US Air Force

Background

- USAF convened the UAS Career Field Steering Group (Sep '08)
  - Weekly GO and O-6 meetings
  - Goal: Chart the way ahead for a distinct cadre of UAS warfighting professionals
- Consulted with training/operations experts across the AF to design a robust curriculum for ground-up, UAS-Specific training
- Beta 1 – 8 graduates Sep '09, in CMR training
  - 10 Captains from rated and non-rated career fields
- Beta 2 – Complete with the first 4 phases in the FTU now
  - 10 Lt's from accession sources (USAFA, ROTC, OTS)
- AFRL conducting performance feedback research to optimize curriculum

RPA Pipeline Training



CREW-6255

Beta Test Syllabi

- Initial Flight Training (IFT) – Randolph, AFB
  - ~35 flying hrs, (incl. 3 hrs x-cntry, 3 hrs night, 3 hrs of sim inst)
- UAS Instrument Qualification (UIQ) - Randolph
  - Instrument tng derived from T-6 syllabus
  - 120 hrs academics, 36 sims (46 hrs), no flying
- UAS Fundamentals Course (UFC) - Randolph
  - 100 hrs academics, 7 sims (11 hrs) - ATO, SPINS, Intro to combat ops, etc)
- Joint Air Ground Operations School/Joint Firepower Course - Nellis
  - 80 hrs academics (CAS fundamentals, TACS, weapons, etc.)
- MQ-1 Formal Training Unit - Creech
  - 90 hrs academics, 16 sims (45 hrs), 11 sorties (28 flying hrs)

Way Ahead/Next Steps

- Continue to enhance training curriculum based on new technologies and mission requirements
- Beta 3, 4 and 5 selected
  - Beta 3 started IFT in January
- Crawl, Walk, Run approach
  - 60 graduates planned for '10
  - 135 graduates planned for '11
  - Mid term capacity of 250

Panel Topic

UAS Procedures

COL Bob Hess

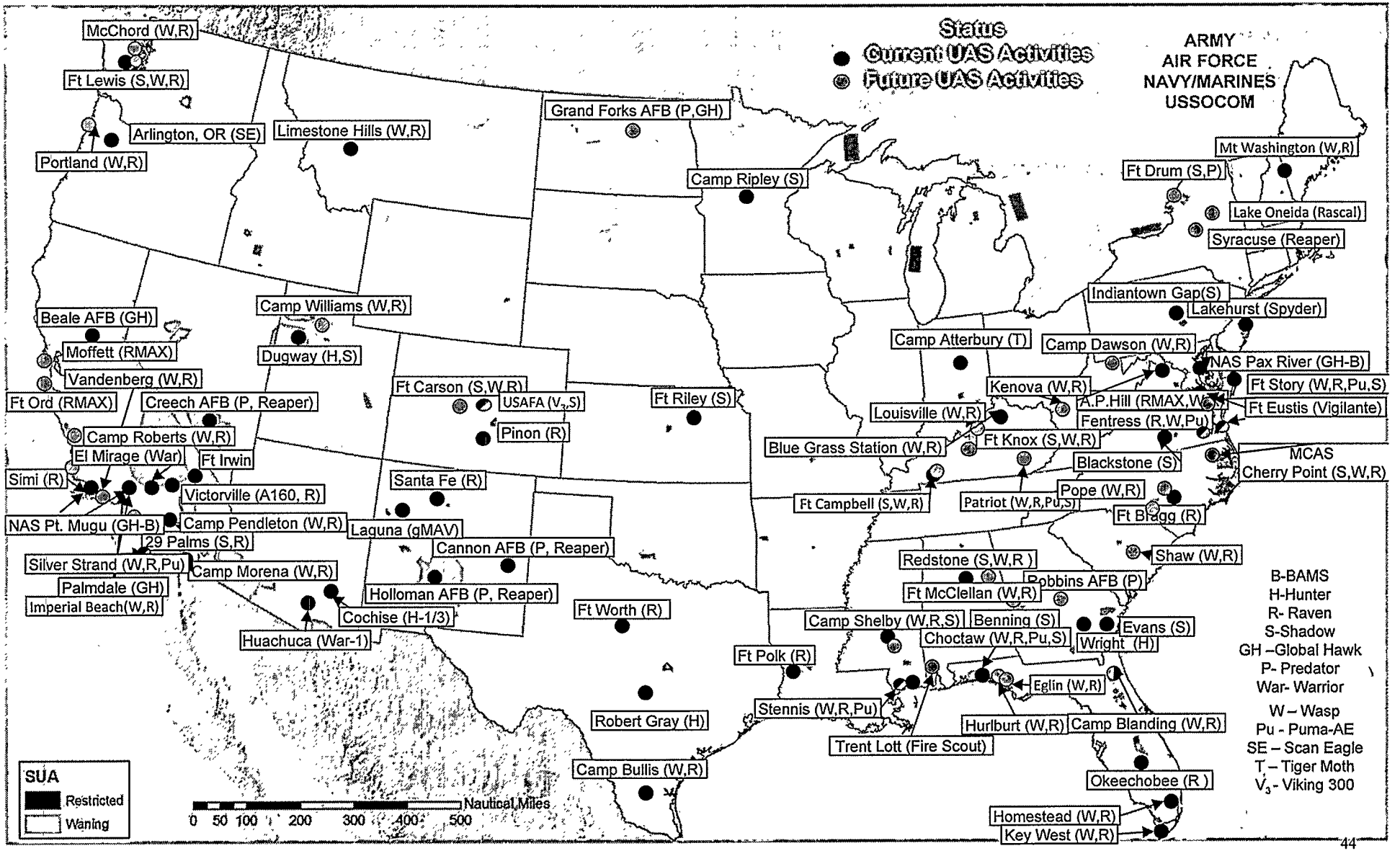
DoD Policy Board on Federal Aviation

What's Driving Requirements

- DOD trains and operates as a Joint force; UAS are key to successful operations; train the way we fight
- Support to pre-deployment and post-deployment training/operations
- Support to disaster relief, Defense Support to Civil Authority, and NORTHCOM contingency operations
- Fielding of new systems to active and reserve component
- Eventual redeployment of UAS from Iraq and Afghanistan
- Current and Future Training Requirements
  - Night operations
  - Multi-ship operations
  - Manned-Unmanned mixed operations
  - Routine Interagency/NORTHCOM exercise/support

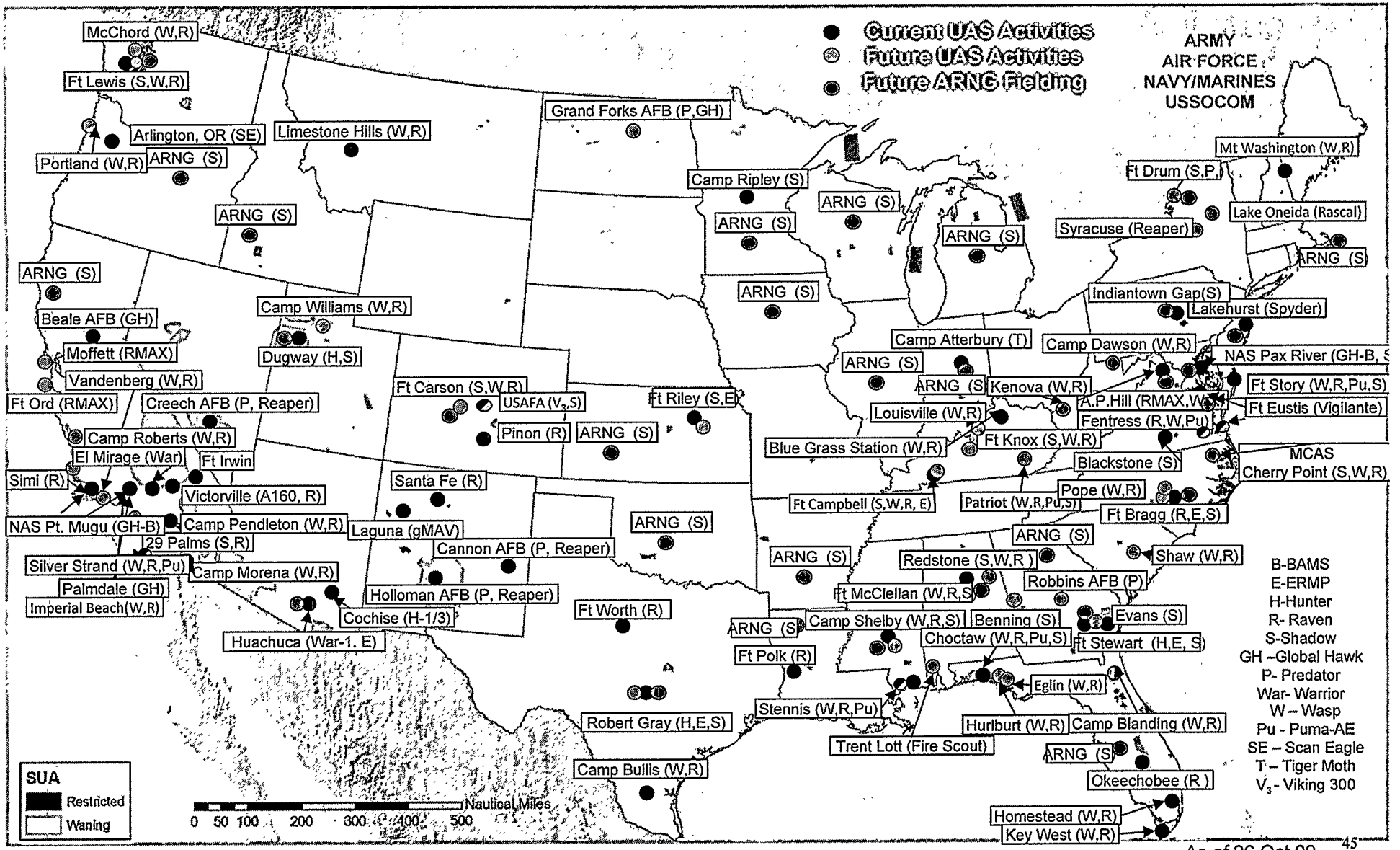
DoD UAS Activities

Current and Projected Through FY11



DoD UAS Activities

Projected Operations Through FY16

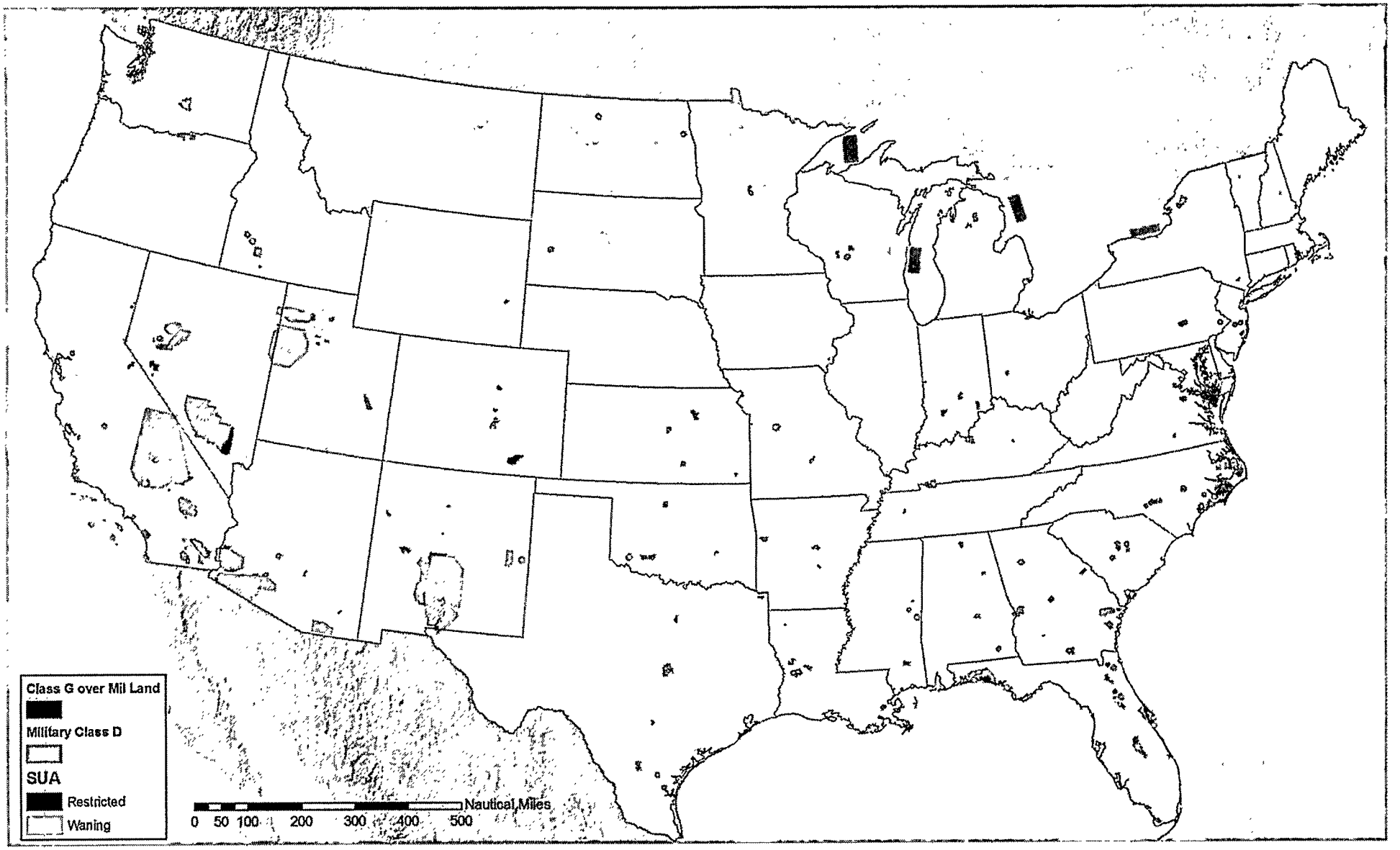


As of 26 Oct 09

Policy and Procedures

- The requirement for airspace access will increase over time; we need to prepare now to meet current and future demand
- Use all the tools in the toolbox; prepare our forces for combat and civil support requirements
  - ExCom leadership is a powerful force for progress
  - Policy and procedure changes are the focus in the near term
  - Advances in technology used to fill in the gaps in the future
- Initial focus will produce near term change; streamline COA process; reduce COA requirements; increase NAS access
- Multi-agency COA Work Group is progressing well; recommendations will improve the COA process and provide measurable results
- Continue to build on existing bilateral agreements with the FAA; synchronize with ExCom direction to ensure unity of effort

RAs, WAs, Non-Joint Use Class D; Class G over Military Reservations

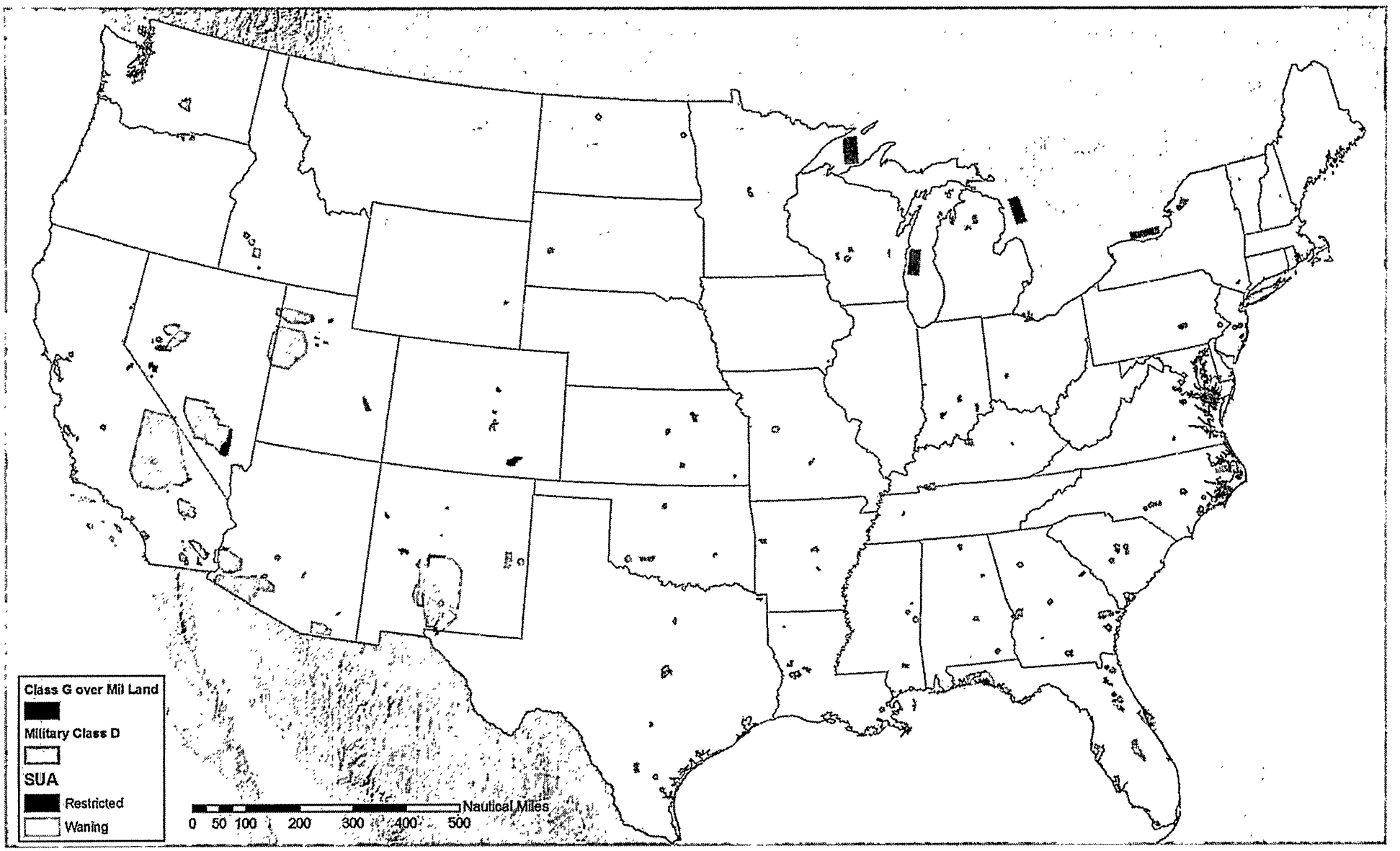


CREW-6263

Bilateral Agreements
DoD Recommendations

- Focused on enhancing DOD UAS access to the NAS; conducting operations safely
- Recommended changes to the current agreement
  - Extend notification procedures to allow Small UAS to fly in Class G airspace off military controlled land
  - Use notification procedures similar to Class G for Class D Non-Joint Use Airfields; transitions to adjoining RA
  - COA renewals – if no changes to the COA, the renewal will go through an abbreviated COA process
  - Extend the COA term from 12 months to 24 months
  - Develop standard lost link procedures to provide predictability to ATC controllers
- These recommendations are in line with the ExCom COA WG efforts

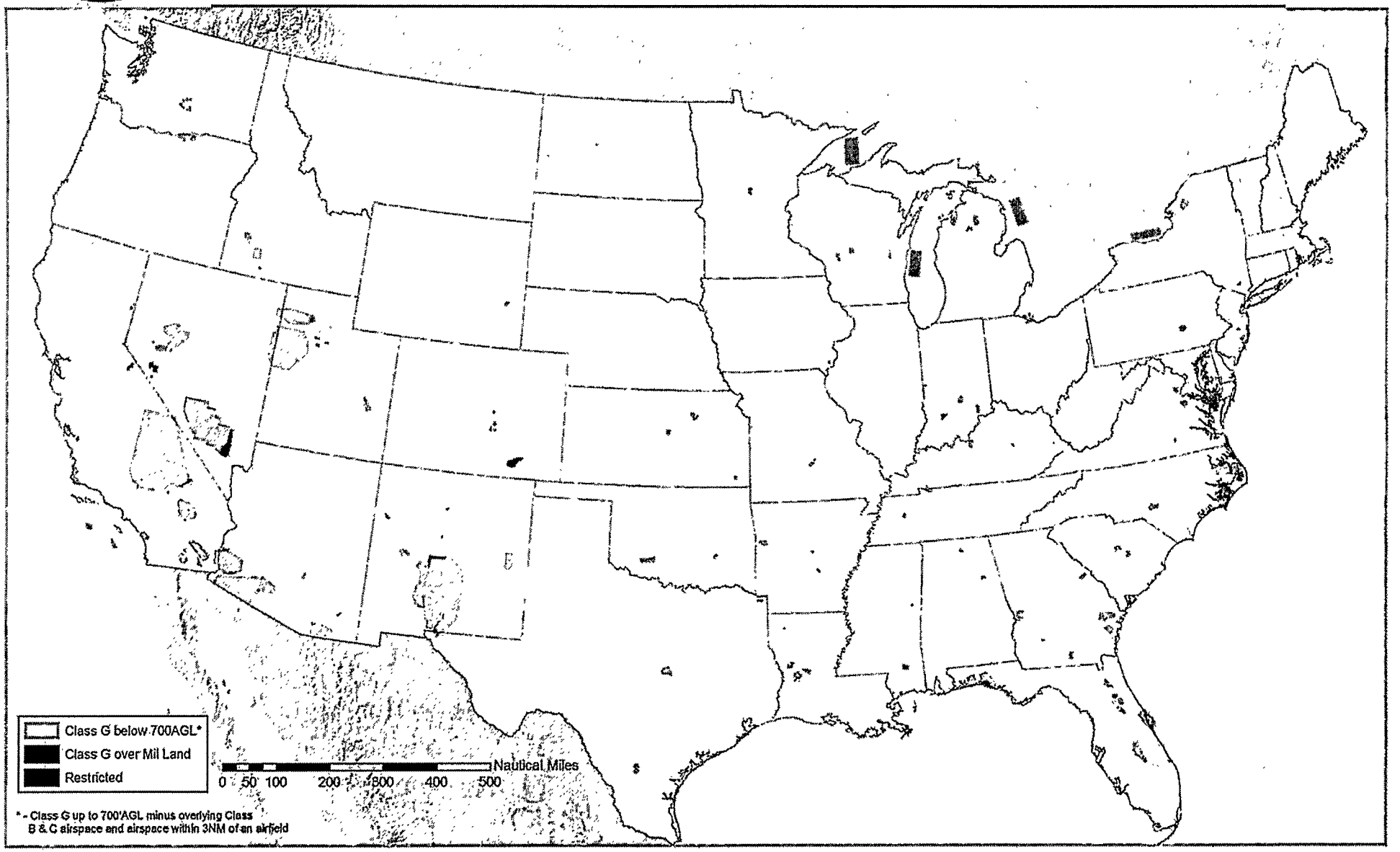
RAs, WAs, Non-Joint Use Class D; Class G over Military Reservations



CREW-6265

Class G Airspace

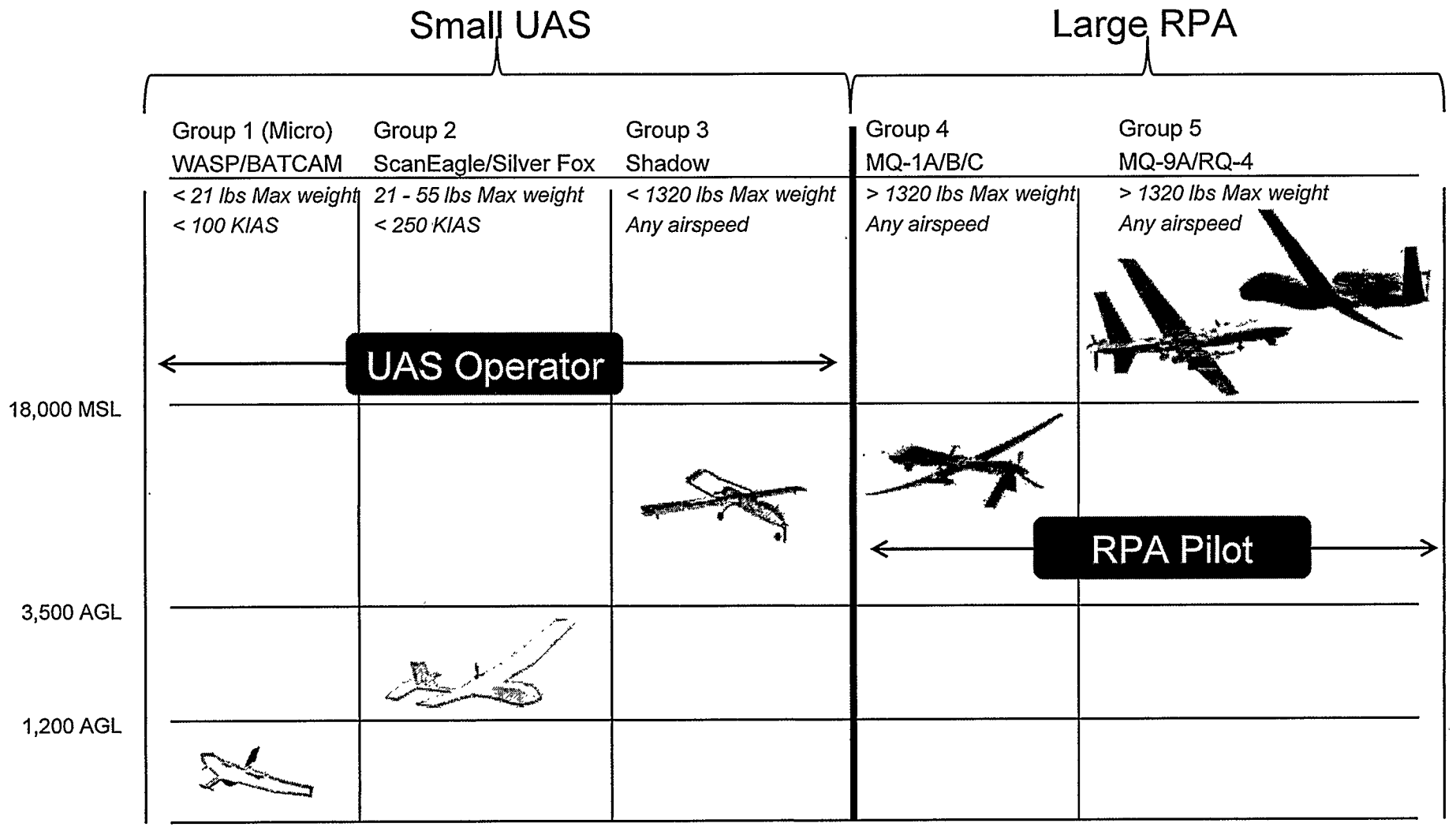
Surface to 700' AGL



CREW-6266

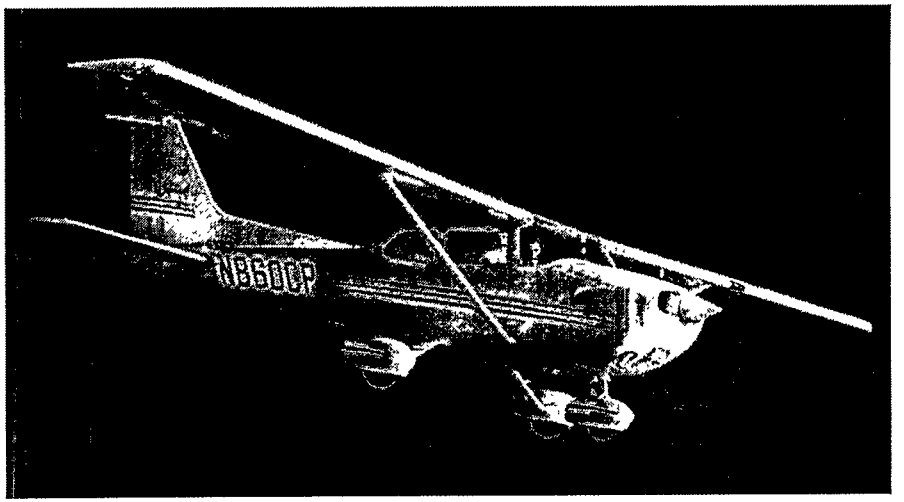
BACK-UP

RPA Categories



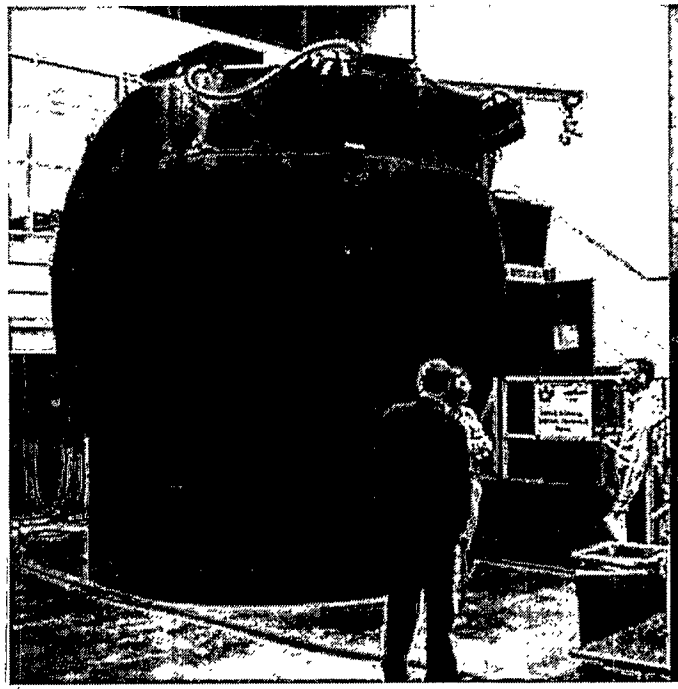
RPA Initial Flight Training (RIFT)

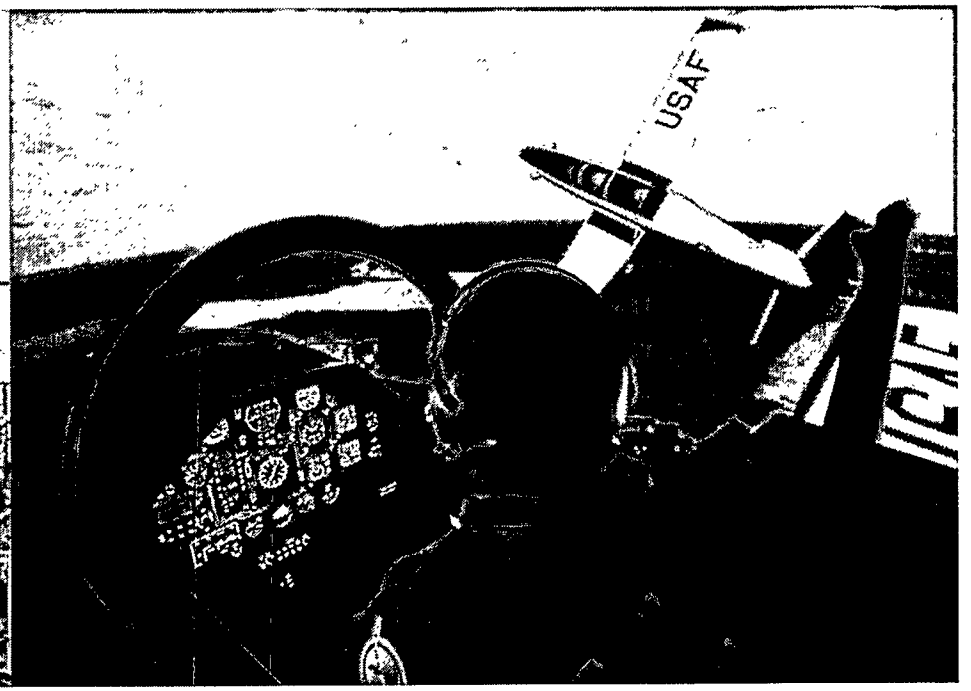
- Objective: Develop fundamentally sound, NAS-qualified Air Force RPA pilot candidates
- Method: Contract Flight Training Facility
  - 35 - 40 hours total flying time
  - Written exams and practical checkrides
  - Graduates proceed to RPA Instrument Qualification (RIQ) program



RPA Instrument Qualification (RIQ)

- BETA Pilots only. 38 sims, 49 hours, 162 academic hours, 23 hours instrument time over 9 calendar weeks
- Currently utilizes a T-6 simulator; transitioning to dedicated Instrument sim in FY11





RIQ Instrument Qualification (Detail)

Weather

Atmospheric Structure

Atmospheric Mechanics

Frontal Mechanics

Thunderstorms

Weather Hazards

METARS and TAFS

Weather Charts and Imagery

Watches and Advisories

DD 175-1

Aerodynamics

Basic Theory

Lift and Drag

Wake Turbulence and Wind Shear

Introduction to Cockpit / Crew Resource Management (CRM)

Situational Awareness

Flight Integrity / Wingman Consideration

Task Management

Communication

Decision Making and Risk Management

Introduction to CRM (Reading Assignment not tracked in TIMS)

Flying Fundamentals

TOLD Computations

Clearing, Cross-check, and Basic Flight

Taxi and Takeoff

Departure and Climb

Traffic Patterns

Landing

Instruments 1

Instrument Displays and Cross-check

Turns, Climbs, and Descents

Instrument Maneuvers

Introduction to Radio Instruments

Instruments 2

Advanced Instruments Overview

FLIP, NOTAMs and Charts

Instrument Takeoff and Departure

Arrival Preparation and Holding

Descent, and Penetration

Low Altitude Approaches

Final Approach

Radar Approaches

Transition to Landing and Missed Approach

T-6 Navigation

IFR Mission Planning

IFR Navigation

IFR Mission Planning Lab

IFR Navigation Review

VFR Mission Planning

VFR / Low-level Navigation

Lost Procedures

VFR Arrivals

VFR Navigation Review

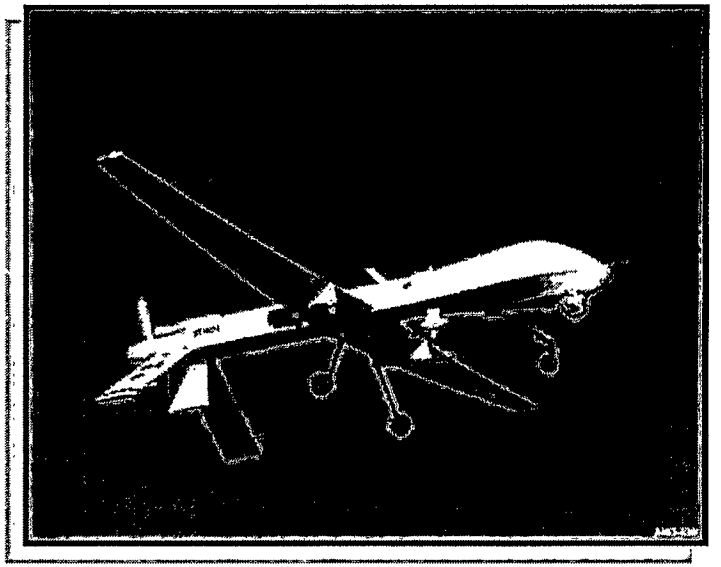
Low-level Planning Lab

Strange Field Procedures

ICAO & SARPs Introduction

RPA Fundamentals Course (RFC)

- Academics (135 hours)
  - 21 Training Days
- SUPT Pilot/Beta/SO into RPA
  - ROE
  - Use of Deadly Force
  - What it takes to operate in battle space
  - CRM
- Flying Training (no manned aircraft)
  - Simulator Use (7 missions/labs)
  - Desktop PC based Flight Training Device; currently A-10C; Predator/Reaper (PRIME) version in development



OSD UAS Airspace Integration Plan

Overview

- Purpose
- Requirement
- Equities
- Foundational Activities
- UAS NAS Access Profiles
- Validation Activities
- Way Ahead
- Summary